DOCUMENT RESUME

ED 269 270 SE 046 589

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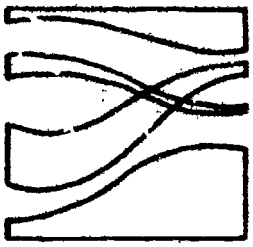
TITLE Results from First and Second Individual Interviews (February and May 1980) of the Second Phase of the Longitudinal Study. Working Paper No. 310.
INSTITUTION Wisconsin Univ., Madison. Research and Development Center for Individualized Schooling.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE Jul 81
GRANT OB-NIE-G-81-0009
NOTE 135p.; For related documents, see SE 046 583-590.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *Addition; Educational Research; *Elementary School Mathematics; Error Patterns; Grade 2; Interviews; Manipulative Materials; *Mathematics Instruction; Primary Education; *Problem Solving; *Subtraction
IDENTIFIERS *Mathematics Education Research

ABSTRACT

Data are reported from the first and second individual interviews conducted in 1980 in the second phase of a 3-year study on addition and subtraction using verbal problem solving. The second phase is concerned with children's performance on verbal addition and subtraction problems which contain two-digit numbers, half of which require regrouping for correct computational solutions. Ninety-six second-grade children in two schools in Wisconsin that used the Developing Mathematical Processes program were individually administered 12 verbal problems that could be solved using addition or subtraction. Responses were coded in terms of appropriateness of strategy, correct or incorrect answer, type of error, mode of representation, and solution strategy. Group data on the problems as well as information on individual subjects are reported. Appendices contain sample problem tasks and individual student profiles. (Author/MNS)



Working Paper No. 310

Results From First and Second Individual Interviews (February and May 1980) of the Second Phase of the Longitudinal Study

by Constance M. Anick, Anne E. Buchanan, Thomas P. Carpenter, James M. Moser, and Ruth M. Steinberg

July 1981

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July 1981

Published by the Wisconsin Research and Development Center for Individualized Schooling. The project presented or reported herein was performed pursuant to a grant from the National Institute of Education, Department of Education. However, the opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education, and no official endorsement by the National Institute of Education should be inferred.

Center Grant No. OB-NIE-G-81-0009

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Abstract

This report presents data from the first and second individual interviews of the second phase of a three-year study on addition and subtraction verbal problem solving. The second phase of the study is concerned with children's performance on verbal addition and subtraction problems which contain two-digit numbers, half of which require regrouping for correct computational solution. The study is being carried out by the Mathematics Work Group of the Wisconsin Research and Development Center for Individualized Schooling. Ninety-six second-grade children were individually administered 12 verbal problems that could be solved using addition or subtraction. Responses were coded in terms of appropriateness of strategy, correct or incorrect answer, type of error, mode of representation, and solution strategy. Group data on the problems as well as information on individual subjects are reported in this paper.

Introduction

A major aim of mathematical instruction is to enable students to acquire concepts and skills requisite for solving problems of many types. A principle goal of mathematical education research is to understand how children acquire those concepts and skills and to understand how selected pedagogical and psychological factors are related to their acquisition. The Mathematics Work Group of the Wisconsin Research and Development Center for Individualized Schooling is presently conducting a program of research focused on a small set of those concepts and skills. Our interest lies in arithmetical learning, and in particular, in the acquisition of concepts and skills related to addition and subtraction of whole numbers.

The research program is attempting to relate pupil performance on selected arithmetic skills to pupil cognitive processes, instructional materials, and teachers' classroom behaviors. The interrelationship of these variables is depicted in Figure 1. Using this framework, we are proceeding to:

1. identify important addition and subtraction skills;
2. review past empirical data or collect new data on these skills;
3. re-examine these mathematical skills and hypothesize how they are related to underlying cognitive skills;
4. examine the instructional materials designed to teach these skills; and
5. conduct a series of empirical studies on the appropriateness of particular teacher classroom behaviors, the appropriateness of instructional materials, and the relationship of specific cognitive skills to mathematical skills.

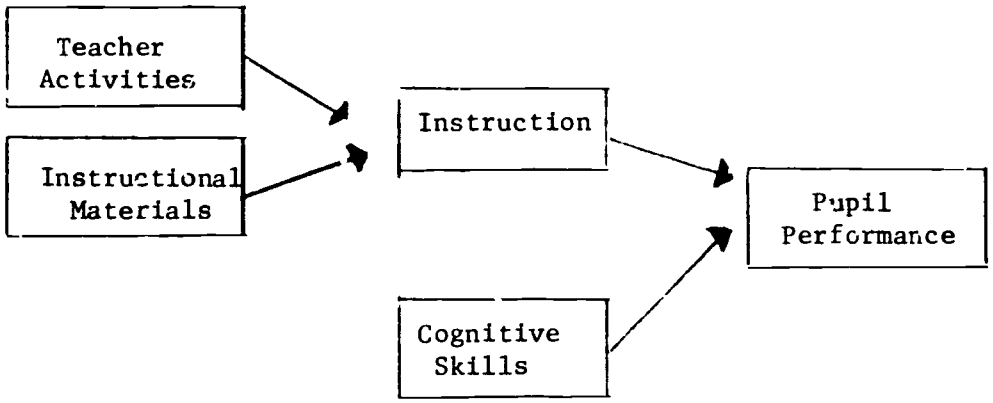

Figure 1. Factors influencing pupil performance.

The work of the Mathematics Work Group is built around the conceptual framework exemplified in Figure 1. The empirical and theoretical investigations generally involve two or more of the factors depicted, and have been organized into four major categories. These are a conceptual paper series, a set of short empirical studies, a major longitudinal study, and an invitational conference of scholars.

This paper relates to the longitudinal study. Approximately 150 students in three spearate schools have been identified as subjects for the study and are being followed for about three years. Pupil performance will be measured in several ways:

1. Individual interviews. At several times during each school year, individual children are administered a set of problem tasks dealing with addition and subtraction. The interviewer attempts to ascertain the children's solution strategy, correctness of answer, type of errors made, and modeling procedures.

2. Group administered paper-and-pencil tests. There are two separate categories of tests:

    a. Achievement monitoring. These tests measure pupil progress toward a set of performance objectives that are contained in the instructional materials. By means of matrix sampling procedures, estimates are made of group performance. Achievement monitoring tests are given shortly after the completion of the instructional units related to arithmetic objectives.

b. Topic inventories. These are very short tests that measure pupil progress toward mastery of the objectives of a specific instructional unit, or topic. Every subject takes the same test, resulting in a measure of individual performance.

Instruction and classroom environment are assessed by direct classroom observation of teacher actions, pupil behaviors, and instructional materials. A trained observer is present each day the instructional units, or topics, dealing with arithmetic objectives are being used. Organizational and grouping measures are noted, along with indications of interactions between teachers and pupils, and among pupils. Measures of pupil engaged time are estimated by observing six target students.

The purpose of this paper is to report the data from the first and second round of individual interviews for the second phase of the longitudinal study. The second phase involves problem tasks with larger two-digit numbers in which patterns of pupil behavior are expected to shift to more algorithmic processes. In the first major section, we present all the background information on subjects and the manner of data collection. In the second major section, summaries of the data are given. Some of the actual data collected in the interviews appears in the Appendices.

Background Information

This section contains background information needed to understand the data summaries given in the next section. As indicated in the various subsections, greater detail may be obtained by referring to other reports from the Mathematics Work Group.

Population and Curriculum Materials

The first and second interviews of individual children were carried out during the periods February 11-13 and May 20-22, 1980, respectively, at the two participating schools:

School 1: a public school in Monona, Wisconsin.

School 3: a parochial school in Madison, Wisconsin.

The subjects for the study consisted of second-grade students, all from predominantly middle class areas, who had parental permission to participate in the interviews. Tables 1 and 2 present the number of children who participated in the study in each school and information about their age during the first and second interviews, respectively.

Each of the schools used as their mathematics curriculum the Developing Mathematical Processes (DMP) program (Romberg, Harvey, Moser, & Montgomery, 1974). The following sequence of topics was suggested to the teachers involved in the second and third years of the study: S-4, 30, S-5, 31, S-6, 33, A-1, 36, A-2, 39, A-3, 37 or 41, A-4. The S-series and A-series topics were specially prepared for the Longitudinal Study (see Kouba & Moser, Note 1 and Note 2).

The first interview was given after the instruction of Topic S-6. By this time in the mathematics instruction, the children had been introduced to solving problem situations involving the numbers 0-20 and should have made substantial progress towards mastery of basic addition and subtraction facts.

The second interview was given after instruction on Topic A-2. The children had received instruction in the subtraction algorithm without

Table 1

Number and Age of Population by School for Interview I

	School 1	School 3	Total
Number of children	63	33	96
Mean age	7 yr. 8 mo.	7 yr. 10 mo.	7 yr. 9 mo.
Maximum age	8 yr. 6 mo.	8 yr. 5 mo.	8 yr. 6 mo.
Minimum age	7 yr. 1 mo.	7 yr. 0 mo.	7 yr. 1 mo.
Male	34	21	55
Female	29	12	41

Table 2

Number and Age of Population by School for Interview II

	School 1	School 3	Total
Number of children	63	33	96
Mean age	8 yr. 0 mo.	8 yr. 2 mo.	8 yr. 1 mo.
Maximum age	8 yr. 10 mo.	8 yr. 9 mo.	8 yr. 10 mo.
Minimum age	7 yr. 5 mo.	7 yr. 4 mo.	7 yr. 5 mo.
Male	34	21	55
Female	29	12	41

regrouping and the addition algorithm with and without regrouping.

Interview Tasks

The interview consisted of six problem types (tasks) given under two conditions which are described later. The characterization of these six problem types is detailed in Moser (Note 3) and in Carpenter and Moser (Note 4).

Table 3 presents representative problems and the order in which the problems were administered to the children. The actual wording for each problem type differed in the two conditions. but the semantic structure remained constant. The actual problems administered are given in Appendix A.

With each problem, two of three numbers from a number triple (x, y, z) defined by $x + y = z$, $x < y < z$, were given. In the two addition problems x, z were presented, with the smaller number always given first. In the four subtraction problems, z and the larger addend y were presented. The order of presentation of y and z varied among problem types. The actual number triples used in the problems are listed in Table 4.

The six problem types were presented under two conditions: two digit numbers without regrouping; and two digit numbers with regrouping. Paper and pencil and small plastic cubes were available to the child to use if desired.

The assignment of the number triples (with and without regrouping) to problem types involved a six-by-six Latin square design resulting in six sets of the six problem types. These sets were uniformly and randomly distributed across subjects. The Latin squares for the without regrouping

Table 3

Representative Problem Types

Task 1.	Joining (Addition)	Michael has 12 toy cars. His mother gave him 15 more toy cars. How many toy cars did Michael have altogether?
Task 2.	Separating (Subtraction)	Terry had 35 pictures. She gave 21 pictures to Joe. How many pictures did Terry have left?
Task 3.	Part-Part-Whole (Subtraction)	There are 28 cartons of milk. 16 are chocolate and the rest are white. How many cartons of white milk are there?
Task 4.	Part-Part-Whole (Addition)	Jane has 11 red flowers. She also has 18 yellow flowers. How many flowers does Jane have altogether?
Task 5.	Comparison (Subtraction)	Sue has 16 fishing worms. Her friend Ted as 29 fishing worms. How many more worms does Ted have than Sue?
Task 6.	Joining Missing Addend (Subtraction)	Robert has 23 coins. How many more coins does he have to put with them to have 37 coins?

Table 4

Listing of Number Triples Used in Verbal Problems

Without Regrouping	With Regrouping
12-15-27	12-19-31
12-16-28	13-18-31
11-18-29	14-18-32
13-16-29	16-17-33
14-21-35	15-19-34
14-23-37	17-19-36

number domain (D) and the with regrouping number domain (E) are presented in Tables 5 and 6, respectively. The number in the box ($\square$) in each entry represents the solution the children were to find. The order of the other two given numbers in the tables corresponds to the order in which those numbers appeared in the problem (cf. Table 3). The assignment of problem sets to subjects is listed in Appendix C.

Task sets for a particular level were assigned to children so that the same number triple did not occur in the same problem type (task) in any subsequent interview.

Interview Method

Trained interviewers administered the interviews. For the first interview, the interview process for the two schools took three days, 11th to 1[illegible] of February, 1980; for the second interview, it also took

Table 5

D Number Triples

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Set 1	12, 15, 27	35, 21, 14	28, 16, 12	11, 18, 29	16, 29, 13	23, 37, 14
Set 2	14, 21, 35	29, 16, 13	37, 23, 14	12, 16, 28	15, 27, 12	18, 29, 11
Set 3	14, 23, 37	29, 18, 11	27, 15, 12	[illegible], 16, 29	21, 35, 14	16, 28, 12
Set 4	13, 16, 29	27, 15, 12	29, 18, 11	14, 23, 37	16, 28, 12	21, 35, 14
Set 5	11, 18, 29	28, 16, 12	35, 21, 14	12, 15, 27	23, 37, 14	16, 29, 13
Set 6	12, 16, 28	37, 23, 14	29, 16, 13	14, 21, 35	18, 29, 11	15, 27, 12

Table 6

E Number Triples

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Set 1	16, 17, [33]	31, 18, [13]	34, 19, [15]	14, 18, [32]	19, 31, [12]	19, 36, [17]
Set 2	17, 19, [36]	31, 19, [12]	3[illegible], 18, [14]	16, 17, [33]	19, 34, [15]	18, 31, [13]
Set 3	13, 18, [31]	36, 19, [17]	33, 17, [16]	12, 19, [31]	18, 32, [14]	19, 34, [15]
Set 4	12, 19, [31]	32, 18, [14]	36, 19, [17]	15, 19, [34]	18, 31, [13]	17, 33, [16]
Set 5	14, 18, [32]	34, 19, [15]	31, 18, [13]	17, 19, [36]	17, 33, [16]	19, 31, [12]
Set 6	15, 19, [34]	33, 17, [16]	31, 19, [12]	13, 18, [31]	19, 36, [17]	18, 32, [14]

three days, the 20th to 22nd of May, 1980. Two or three interviewers worked at a given school on each day. Interviews began soon after school started and continued through the day, with the usual breaks at lunch and recess. Tables 7 and 8 detail the assignment of interviewers to schools for both sets of interviews.

Each interviewer was able to conduct 8 to 18 interviews a day, depending on the schools' schedules. At the schools the interviewers were assigned interview areas, which, for the most part, were quiet rooms separate from distracting activities.

The interviewers went to the classroom to get a child, and they visited together on the way to the interview area. The verbal tasks were reread to the child as often as necessary so that remembering the given numbers or relationships caused no difficulty.

An individual interview required one session lasting 15 to 20 minutes, with each child receiving the same sequence of problems.

Coding Subject Responses

All of the possible student responses are presented in detail in Cookson and Moser (Note 5). Only a brief description is presented here. The coding sheet upon which responses were recorded is shown in Figure 2.

Model

C The child used cubes to model (all or part of) the problem.

F The child used fingers to model.

T The child used tallies to model.

P The child used pictures to model.

H+ The child wrote a horizontal addition sentence.

Table 7

Interviewer School Assignment (Interview I)

Interviewer Code #	Date 2/11	2/12	2/13
12	School 1	School 1	School 1
27	School 1		
30	School 1	School 1	School 1
34	School 3	School 1	
41		School 3	
45	School 1	School 3	
72	School 3	School 3	

Table 8

Interviewer School Assignment (Interview II)

Interviewer Code #	Date 5/20	5/21	5/22
12		School 1	School 1
27		School 1	
30	School 3	School 1	School 3
34	School 1		
38	School 3		School 3
41		School 1	School 1
45	School 1		
58	School 3		School 1
72	School 1		School 3

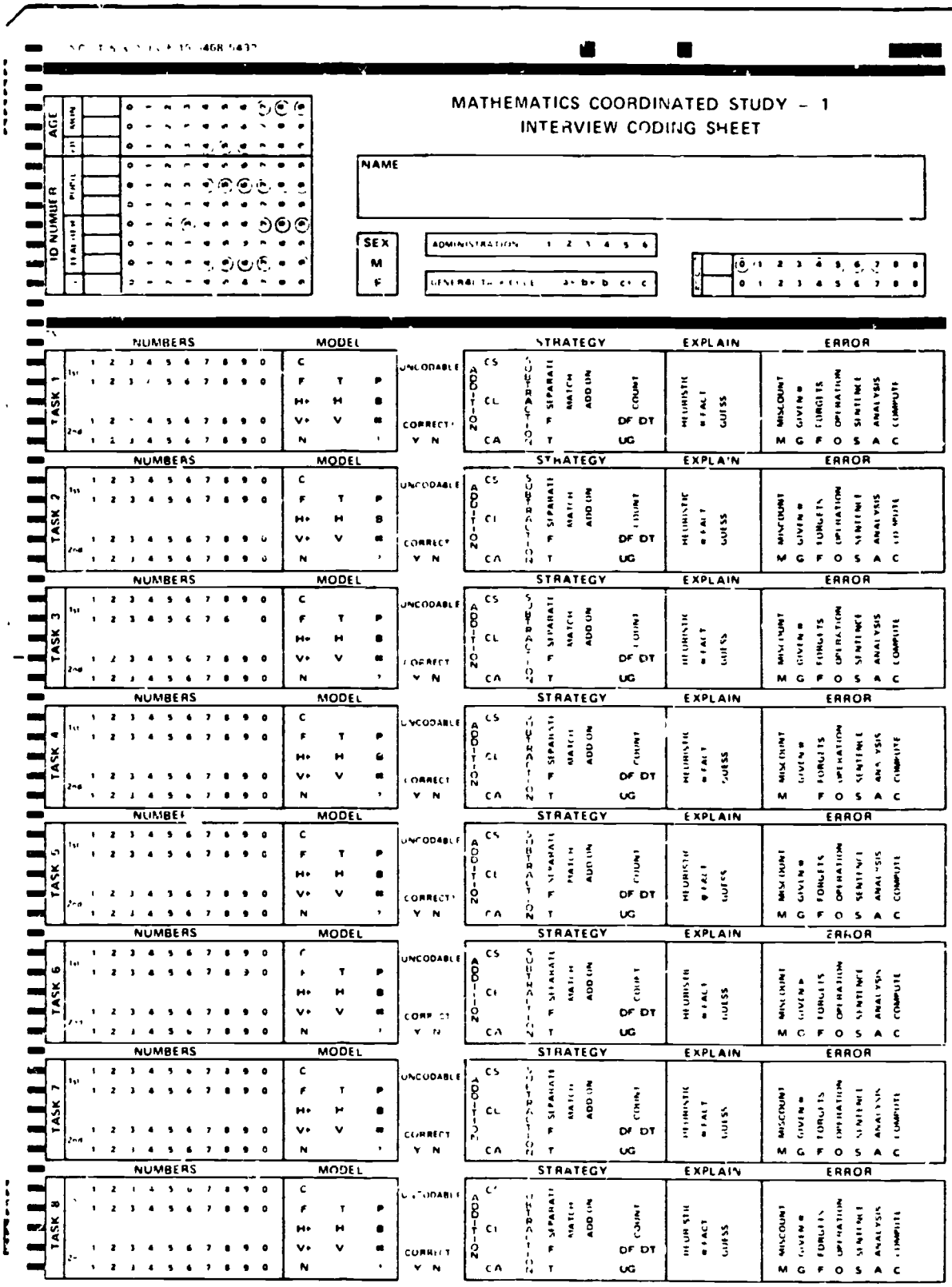

Figure 2. Electronically scored interviewer coding sheet.

H- The child wrote a horizontal subtraction sentence.

V+ The child wrote a vertical addition sentence.

V- The child wrote a vertical subtraction sentence.

The child wrote one or more numbers.

B The child used an organizing box to model.

N The child used no physical model.

O The child used some other physical mode, such as chairs or numerals on a clock face.

? The child gives no numerical response to the problem.

Correctness

Y The answer was correct.

N The answer was not correct.

UN Uncodable: The child gave an answer, but the interviewer was unable to identify the strategy used.

Strategy

Addition:

CS Counting On from Smaller or Counting On from First Number: When counting cubes, fingers, or mentally, the counting sequence began either with the smaller number (first number given in the story) or the successor of that number.

CL Counting On from Larger: The counting sequence began with the larger (second) given number or with the successor of that number.

CA Counting All: The child counted the complete union of the sets represented in the problem, with counting sequence started at "one, two, ..."

Subtraction:

F Separate From: The child models the larger given set and then takes away or separates, one at a time, a number of cubes or objects equal to the smaller given number in the problem. Counting the remainder set gives the answer.

T Separate To: After the larger set is modeled, the child removes cubes or objects one at a time until the remainder is equal to the second given number in the problem. Counting the number of objects removed gives the answer.

MA Match: The child puts out two sets of cubes or objects, each set standing for one of the given numbers. The sets are then matched one-to-one. Counting the excess of the larger set over the smaller set gives the answer.

AO Add On: The child sets out a number of cubes or objects equal to the smaller given number (an addend). The child then adds cubes to that set one at a time until the new collection is equal to the larger given number. Counting the number of cubes added on gives the answer.

DF Counting Down From: A child initiates a backwards counting sequence beginning with the larger given number. The backwards counting sequence contains as many counting number words as the smaller given number. The last number uttered in the counting sequence is the answer.

DT Count Down To: A child initiates a backwards counting sequence beginning with the larger given number. The sequence ends with

the given smaller number. By keeping track of the number of counting words uttered in this sequence, the child determines the answer to be the number of counting words used in the sequence.

UG Count Up from Given: A child initiates a forward counting sequence beginning with the smaller given number. The sequence ends with the larger given number. Again, by keeping track of the number of counting words uttered in sequence, the child determines the answer.

Addition and Subtraction (Explain or Mental Processes):

HU Heuristic: Heuristic strategies were employed to generate solutions from a small set of known basic facts. These strategies usually were based on doubles or numbers whose sum was 10. This strategy can also be used in connection with the counting sequence strategies--counting on, counting down and counting up from given. In these cases the number to be counted on (as in addition) or to be counted down (as in subtraction) can be decomposed by a heuristic in order to hasten the counting. This often happens in connection with a multiple of 10. These stragies are referred to as "quasi-heuristics."

GU Guess: The child gave an answer with the justification that it was the result of guessing.

AL The child performs the standard addition or subtraction algorithm.

AA Additive algorithm, a variation of the standard algorithm that may occur in connection with a subtraction problem. For example, if the problem is a missing addend one, a child might write something akin to the following $\begin{array}{r} 16 \\ +\_\_ \\ \hline 29 \end{array}$ and proceed in an additive manner by

asking him/herself, "Six plus how many is nine?" and after determining the response of "three" write the numeral 3 in the appropriate position below the numeral 6 of the upper number 16. In a similar fashion the number 1 is determined to be the appropriate one to place in front of the numeral 3 to give the final correct answer of 13.

Error:

M Miscount: The child miscounted in some way.

G (GI) Given Number: The child responded that the answer was one of the two numbers given in the problem.

F Forgets: The child forgot one of the given numbers and thereby found an incorrect answer.

O (OP) Operation: The child used an addition strategy in a problem that must be solved through subtraction, or a subtraction strategy was employed in an addition problem.

S When representing the problem with a symbolic sentence, the child writes an inappropriate sentence.

A If a child opts to use the part-part-whole organizing box (described earlier in the section Models), he or she may err by putting the given numbers in the wrong position in the box which, if followed to its logical conclusion, leads to the use of the wrong operation.

BG This error is a misapplication of a 2-digit computational algorithm or the correct application of an incorrect, or "buggy," algorithm.

CC In the recollection of a basic fact, the child produces the wrong answer. This error occurs in connection with the use of the computational algorithm.

R When symbolically representing a problem, the child misrepresents one or both of the given numbers by transposing the digits of a number.

Presentation of the Data

Data were collected on children's behavior following presentation of a specific verbal problem. The six different verbal problem types were presented at two different levels, resulting in 12 tasks for an individual child. All 96 children who began the interviews were administered the complete set of 12 tasks.

This section begins with a discussion of individual student profiles, which comprise the basic raw data, followed by a summary of pupil response data.

Individual Student Profiles

A record of each subject's response to the 12 tasks was compiled from the coding sheets. These profiles are the basis for all other statistical information appearing in this paper. The profiles for all subjects are contained in Appendix B. Figure 3 provides an example of a student profile.

For each task at each level, the four coded entries in order from left to right are model, correctness, strategy, and error. The abbreviations used are explained in the previous section. In the strategy column (as in much of the data analysis for this study) Uncodable (UN), Given Number GI), Operation (OP), Algorithm (AL), and Additive Algorithm (AA) were treated as strategies.

The hundreds digit of the student ID number identified which school the student attended: 1 or 3.

Student ID Number

Interview 101	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
D	H+ Y AL —	V- Y AL -	V- Y AL -	V+ Y AL -	V- N AL CO	V- Y AL -
E	V- N AL CO	V- N AL R	H+ N AL/OP OP S	H+ N AL CO	V- N AL BG	V- N AL BG

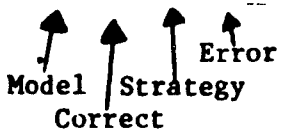

Figure 3. Sample student profile from Interview I.

The actual problem and numbers used in the problem for a given level and task can be obtained by using the following procedure. For example, what was the actual problem read to Student 101 for Task 2 at the D level?

1. Use Appendix A, Problem Tasks by Level, to find the exact wording for Task 2 Interview I at the D level:

> Terry had _____ pictures.
> She gave _____ pictures to Joe.
> How many pictures did Terry have left?

2. Use Appendix C, Number Set Assignment, to find what set was assigned to Student 101 at the D level (Interview I). The entry in the D column for ID #101 is 2.

3. Use Table 4, D Number Triples, to find what number triple was assigned to set 2, Task 2. The entry in this table is 29, 16, 13 , where 13 indicates that 13 is the correct solution. Therefore, Student #101 was given the following problem for Task 2, level D.

> Terry had 29 pictures.
> She gave 16 pictures to Joe.
> How many pictures did Terry have left?

Looking at Figure 3, we can recontruct this child's behavior. The first V- indicates the child wrote a vertical subtraction number sentence. The next entry, 1, indicates the problem was solved correctly. This accounts for the hyphen in the fourth column, indicating no error. The AL in the third column indicates the child used an algorithm to solve the problem.

Population Results

A table for each of the six tasks for Interviews I and II is presented (Tables 9 to 20). Both levels for each task are contained in the same

Table 9

Task 1 (Addition-Joining), Interview I
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	24(25%)	16(17%)
F	Fingers	--	--	10(10%)	11(11%)
H+	Horizontal Addition Sentence	3(3%)	3(3%)	4(4%)	3(3%)
V+	Vertical Addition Sentence	8(8%)	12(13%)	2(2%)	1(1%)
N	No Action	11(11%)	9(9%)	15(16%)	16(17%)
T	Tallies	--	--	8(8%)	10(10%)
H-	Horizontal Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V-	Vertical Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
#	Number	1(1%)	0(0%)	1(1%)	1(1%)
H+; Z	Horizontal Addition With Other Model	--	--	5(5%)	5(5%)
V+; Z	Vertical Addition With Other Model	--	--	1(1%)	5(5%)
H-; Z	Horizontal Subtraction With Other Model	--	--	0(0%)	0(0%)
V-; Z	Vertical Subtraction With Other Model	--	--	0(0%)	0(0%)
Z; Z	Combination of Models	--	--	2(2%)	3(3%)
O	Other	--	--	0(0%)	1(1%)
Y	Correct	19(20%)	20(21%)	40(42%)	39(41%)

Table 9 (Continued)

	Errors	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	23(24%)	20(21%)
F	Forgets	--	--	0(0%)	0(0%)
S	Sentence Error	0(0%)	0(0%)	0(0%)	0(5%)
BG	Buggy Error	0(0%)	1(1%)	--	--
CO	Number Fact Error	0(%)	2(2%)	--	--
R	Representation Error	2(%)	0(%)	0(0%)	0(0%)

	Strategies	D	E
CS	Counts on from Smaller	7(7%)	11(11%)
CL	Counts on from Larger	27(28%)	28(29%)
CA	Counts All	24(25%)	18(19%)
AA	Additive Algorithm	0(0%)	0(0%)
AL	Algorithm	23(24%)	2(2%)
HU	Heuristic	3(3%)	24(25%)
GU	Guess	3(3%)	6(6%)
UN	Uncodable	4(4%)	2(2%)
QCS	Quasi-heuristic/CS	2(2%)	1(2%)
QCL	Quasi-heuristic/CL	2(2%)	3(5%)
QCA	Quasi-heuristic/CA	0(0%)	0(0%)
?		1(1%)	0(0%)
GI	Given Number	0(0%)	0(0%)
OP	Wrong Operation	0(0%)	0(0%)
AA or AL & OP		0(0%)	0(0%)

Table 10

Task 2 (Subtraction-Separate), Interview I
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	26(27%)	18(19%)
F	Fingers	--	--	5(5%)	4(4%)
H+	Horizontal Addition Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V+	Vertical Addition Sentence	0(0%)	0(0%)	0(0%)	0(0%)
N	No Action	5(5%)	2(2%)	19(20%)	22(23%)
T	Tallies	--	--	9(9%)	14(15%)
H-	Horizontal Subtraction Sentence	1(1%)	0(0%)	4(4%)	1(1%)
V-	Vertical Subtraction Sentence	12(13%)	11(11%)	0(0%)	2(2%)
#	Number	0(0%)	0(0%)	0(0%)	0(0%)
H+, Z	Horizontal Addition With Other Model	--	--	0(0%)	0(0%)
V+; Z	Vertical Addition With Other Model	--	--	0(0%)	1(1%)
H-; Z	Horizontal Subtraction With Other Model	--	--	9(9%)	10(10%)
V-; Z	Vertical Subtraction With Other Model	--	--	5(5%)	5(5%)
Z; Z	Combination of Models	--	--	1(1%)	6(6%)
O	Other	--	--	0(0%)	0(0%)
Y	Correct	16(17%)	3(3%)	38(40%)	40(42%)

Table 10 (Continued)

	Error	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	23(24%)	25(26%)
F	Forgets	--	--	0(0%)	0(0%)
S	Sentence Error	0(0%)	1(1%)	0(0%)	1(1%)
BG	Buggy Error	1(1%)	8(8%)	--	--
CO	Number Fact Error	1(1%)	0(0%)	--	--
R	Representation Error	9(0%)	1(1%)	0(0%)	0(0%)

	Strategies	D	E
F	Separate from	46(48%)	46(48%)
T	Separate to	0(0%)	0(0%)
MA	Match	0(0%)	1(1%)
AO	Add on	0(0%)	1(1%)
DF	Count Down from	4(4%)	4(4%)
UG	Count Up from Given	10(10%)	10(10%)
DT	Count Down to	0(0%)	0(0%)
HU	Heuristic	3(3%)	2(2%)
GU	Guess	4(4%)	10(10%)
AL	Algorithm	18(19%)	11(11%)
AA	Additive Algorithm	0(0%)	1(1%)
UN	Uncodable	2(2%)	2(2%)
QDF	Quasi-heuristic/DF	3(3%)	2(2%)
QUG	Quasi-heuristic/UG	1(1%)	4(4%)
QDT	Quasi-heuristic/DT	0(0%)	0(0%)
?		0(0%)	0(0%)
GI	Given Number	0(0%)	0(0%)
OP	Wrong Operation	2(2%)	1(1%)
AA or AL & OP		0(0%)	1(1%)

Table 11

Task 3 (Subtraction-Part-Part-Whole), Interview I

Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	20(21%)	14(15%)
F	Fingers	--	--	10(10%)	4(4%)
H+	Horizontal Addition Sentence	0(0%)	1(1%)	1(1%)	0(0%)
V+	Vertical Addition Sentence	2(2%)	1(1%)	1(1%)	2(2%)
N	No Action	5(5%)	1(1%)	16(17%)	22(23%)
T	Tallies	--	--	10(10%)	15(16%)
H-	Horizonatal Subtraction Sentence	1(1%)	0(0%)	2(2%)	3(3%)
V-	Vertical Subtraction Sentence	9(9%)	10(10%)	0(0%)	2(2%)
#	Number	0(0%)	0(0%)	1(1%)	1(1%)
H+, Z	Horizontal Addition With Other Model	--	--	1(1%)	1(1%)
V+; Z	Vertical Addition With Other Model	--	--	0(0%)	0(0%)
H-; Z	Horizontal Subtraction With Other Model	--	--	9(9%)	7(7%)
V-: Z	Vertical Subtraction With Other Model	--	--	4(4%)	3(3%)
Z, Z	Combination of Models	--	--	2(2%)	7(7%)
O	Other	--	--	0(0%)	0(0%)
Y	Correct	14(15%)	2(2%)	41(43%)	37(39%)

Table 11 (Continued)

	Error	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	19(20%)	15(16%)
F	Forgets	0(0%)	0(0%)	3(3%)	4(4%)
S	Sentence Error	2(2%)	2(2%)	4(4%)	3(3%)
BG	Buggy Error	0(0%)	9(9%)	--	--
CO	Number Fact Error	0(0%)	0(0%)	--	--
R	Representation Error	0(0%)	0(0%)	0(0%)	0(0%)

	Strategies	D	E
F	Separate from	36(38%)	36(38%)
T	Separate to	0(0%)	0(0%)
MA	Match	0(0%)	2(2%)
AO	Add on	1(1%)	0(0%)
DF	Count Down from	2(2%)	3(3%)
UG	Count Up from Given	17(18%)	9(9%)
DT	Count Down to	0(0%)	0(0%)
HU	Heuristic	3(3%)	4(4%)
GU	Guess	4(4%)	7(7%)
AL	Algorithm	14(15%)	10(10%)
AA	Additive Algorithm	0(0%)	1(1%)
UN	Uncodable	6(6%)	8(8%)
QDF	Quasi-heuristic/DF	1(1%)	3(3%)
QUG	Quasi-heuristic/UG	2(2%)	4(4%)
QDT	Quasi-heuristic/DT	0(0%)	2(2%)
?		2(2%)	2(2%)
GI	Given Number	1(1%)	2(2%)
OP	Wrong Operation	4(4%)	3(3%)
AA or AL & OP		3(3%)	2(2%)

Table 12

Task 4 (Addition-Part-Part-Whole), Interview I
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	18(19%)	11(11%)
F	Fingers	--	--	12(13%)	11(11%)
H+	Horizontal Addition Sentence	4(4%)	4(4%)	2(2%)	3(3%)
V+	Vertical Addition Sentence	14(15%)	11(11%)	0(0%)	2(2%)
N	No Action	13(14%)	8(8%)	14(15%)	17(18%)
T	Tallies	--	--	8(8%)	10(10%)
H-	Horizontal Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V-	Vertical Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
#	Number	0(0%)	0(0%)	0(0%)	0(0%)
H+, Z	Horizontal Addition With Other Model	--	--	5(5%)	6(6%)
V+; Z	Vertical Addition With Other Model	--	--	3(3%)	5(5%)
H-; Z	Horizontal Subtraction With Other Model	--	--	0(0%)	0(0%)
V-; Z	Vertical Subtraction With Other Model	--	--	0(0%)	0(0%)
Z; Z	Combination of Models	--	--	3(3%)	5(5%)
O	Other	--	--	0(0%)	0(0%)
Y	Correct	30(31%)	18(19%)	38(40%)	50(52%)

Table 12 (Continued)

	Errors	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	18(19%)	12(13%)
F	Forgets	1(1%)	1(1%)	0(0%)	0(0%)
S	Sentence Error	0(0%)	0(0%)	0(0%)	0(0%)
BG	Buggy Error	0(0%)	1(1%)	--	--
CO	Number Fact Error	0(0%)	3(3%)	--	--
R	Representation Error	0(0%)	0(0%)	0(0%)	0(0%)

	Strategies	D	E
CS	Counts on from Smaller	8(8%)	11(11%)
CL	Counts on from Larger	27(28%)	29(30%)
CA	Counts All	18(19%)	18(19%)
AA	Additive Algorithm	0(0%)	0(0%)
AL	Algorithm	31(32%)	23(24%)
HU	Heuristic	0(0%)	3(3%)
GU	Guess	4(4%)	7(7%)
UN	Uncodable	4(4%)	0(0%)
QCS	Quasi-heuristic/CS	0(0%)	1(1%)
QCL	Quasi-heuristic/CL	2(2%)	3(3%)
QCA	Quasi-heuristic/CA	0(0%)	0(0%)
?		0(0%)	0(0%)
GI	Given Number	0(0%)	0(0%)
OP	Wrong Operation	0(0%)	0(0%)
AA or AL & OP		0(0%)	1(1%)

Table 13

Task 5 (Subtraction-Comparison), Interview I
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	12(13%)	10(10%)
F	Fingers	--	--	11(11%)	5(5%)
H+	Horizontal Addition Sentence	0(0%)	0(0%)	4(4%)	0(0%)
V+	Vertical Addition Sentence	1(1%)	1(1%)	2(2%)	1(1%)
N	No Action	3(3%)	1(1%)	23(24%)	30(31%)
T	Tallies	0(0%)	0(0%)	9(9%)	12(13%)
H-	Horizonatal Subtraction Sentence	1(1%)	1(1%)	1(1%)	1(1%)
V-	Vertical Subtraction Sentence	10(10%)	10(10%)	1(1%)	2(2%)
#	Number	0(0%)	0(0%)	1(1%)	1(1%)
H+, Z	Horizontal Addition With Other Model	--	--	1(1%)	5(5%)
V+; Z	Vertical Addition With Other Model	--	--	0(0%)	1(1%)
H-; Z	Horizontal Subtraction With Other Model	--	--	3(3%)	4(4%)
V-; Z	Vertical Subtraction With Other Model	--	--	2(2%)	2(2%)
Z; Z	Combination of Models	--	--	7(7%)	7(7%)
O	Other	--	--	0(0%)	2(2%)
Y	Correct	13(14%)	2(2%)	37(39%)	33(34%)

Table 13 (Continued)

	Error	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	18(19%)	17(18%)
F	Forgets	0(0%)	0(0%)	5(5%)	4(4%)
S	Sentence Error	4(4%)	3(3%)	8(8%)	10(10%)
BG	Buggy Error	0(0%)	10(10%)	--	--
CO	Number Fact Error	1(1%)	0(0%)	--	--
R	Representation Error	0(0%)	0(0%)	0(0%)	0(0%)

	Strategies	D	E
F	Separate from	11(11%)	17(18%)
T	Separate to	1(1%)	0(0%)
MA	Match	8(8%)	10(10%)
AO	Add on	2(2%)	1(1%)
DF	Count Down from	1(1%)	0(0%)
UG	Count Up from Given	27(28%)	22(23%)
DT	Count Down to	0(0%)	0(0%)
HU	Heuristic	3(3%)	5(5%)
GU	Guess	4(4%)	9(9%)
AL	Algorithm	14(15%)	11(11%)
AA	Additive Algorithm	0(0%)	1(1%)
UN	Uncodable	5(5%)	3(3%)
QDF	Quasi-heuristic/DF	1(1%)	0(0%)
QUG	Quasi-heuristic/UG	4(4%)	4(4%)
QDT	Quasi-heuristic/DT	1(1%)	0(0%)
?		4(4%)	0(0%)
GI	Given Number	3(3%)	5(5%)
OP	Wrong Operation	7(7%)	7(7%)
AA or AL & OP		1(1%)	1(1%)

Table 14

Task 6 (Subtraction-Joining, missing Addend), Interview I
Number (%) of Children Coded for a Particular Behavior

Model		Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	7(7%)	10(10%)
F	Fingers	--	--	19(20%)	8(8%)
H+	Horizontal Addition Sentence	0(0%)	1(1%)	2(2%)	1(1%)
V+	Vertical Addition Sentence	1(1%)	0(0%)	2(2%)	0(0%)
N	No Action	5(5%)	1(1%)	23(24%)	25(26%)
T	Tallies	--	--	8(8%)	10(10%)
H-	Horizontal Subtraction Sentence	3(3%)	0(0%)	1(1%)	2(2%)
V-	Vertical Subtraction Sentence	8(8%)	8(8%)	0(0%)	1(1%)
#	Number	0(0%)	0(0%)	1(1%)	2(2%)
H+, Z	Horizontal Addition With Other Model	--	--	1(1%)	4(4%)
V+; Z	Vertical Addition With Other Model	--	--	1(1%)	2(2%)
H-; Z	Horizontal Subtraction With Other Model	--	--	1(1%)	1(1%)
V-; Z	Vertical Subtraction With Other Model	--	--	1(1%)	1(1%)
Z; Z	Combination of Models	--	--	7(7%)	16(17%)
O	Other	--	--	0(0%)	1(1%)
Y	Correct	16(17%)	2(2%)	47(49%)	39(41%)

Table 14 (Continued)

	Error	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	13(14%)	17(18%)
F	Forgets	0(0%)	0(0%)	2(2%)	1(1%)
S	Sentence Error				
BG	Buggy Error	0(0%)	7(7%)	--	--
CO	Number Fact Error	1(1%)	0(0%)	--	--
?	Representation Error	0(0%)	0(0%)	0(0%)	0(0%)

	Strategies	D	E
F	Separate from	4(4%)	6(6%)
T	Separate to	0(0%)	0(0%)
MA	Match	0(0%)	2(2%)
AO	Add on	10(10%)	14(15%)
DF	Count Down from	1(1%)	0(0%)
UG	Count Up from Given	40(42%)	30(31%)
DT	Count Down to	0(0%)	0(0%)
HU	Heuristic	1(1%)	8(8%)
GU	Guess	4(4%)	9(9%)
AL	Algorithm	18(19%)	8(8%)
AA	Additive Algorithm	0(0%)	1(1%)
UN	Uncodable	8(8%)	3(3%)
QDF	Quasi-heuristic/DF	0(0%)	1(1%)
QUG	Quasi-heuristic/UG	4(4%)	4(4%)
QDT	Quasi-heuristic/DT	0(0%)	0(0%)
?		2(2%)	2(2%)
GI	Given Number	0(0%)	1(1%)
OP	Wrong Operation	4(4%)	6(6%)
AA or AL & OP		0(0%)	1(1%)

Table 15

Task 1 (Addition-Joining), Interview II
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	11(11%)	5(5%)
F	Fingers	--	--	0(0%)	2(2%)
H+	Horizontal Addition Sentence	1(1%)	0(0%)	0(0%)	0(0%)
V+	Vertical Addition Sentence	35(36%)	52(54%)	0(0%)	2(2%)
N	No Action	21(22%)	13(14%)	13(14%)	12(13%)
T	Tallies	--	--	7(7%)	3(3%)
H-	Horizonetal Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V-	Vertical Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
#	Number	2(2%)	0(0%)	0(0%)	2(2%)
H+, Z	Horizontal Addition With Other Model	--	--	2(2%)	0(0%)
V+; Z	Vertical Addition With Other Model	--	--	0(0%)	0(0%)
H-; Z	Horizontal Subtraction With Other Model	--	--	0(0%)	0(0%)
V-; Z	Vertical Subtraction With Other Model	--	--	0(0%)	0(0%)
Z; Z	Combination of Models	--	--	4(4%)	4(4%)
O	Other	--	--	0(0%)	0(0%)
Y	Correct	56(58%)	51(53%)	21(22%)	15(16%)

Table 15 (Continued)

	Errors	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	11(11%)	9(9%)
F	Forgets	0(0%)	0(0%)	0(0%)	0(0%)
S	Sentence Error	0(0%)	0(0%)	0(0%)	0(0%)
BG	Buggy Error	1(1%)	7(7%)	--	--
CO	Number Fact Error	0(0%)	6(6%)	--	--
R	Representation Error	2(2%)	1(1%)	0(0%)	0(0%)

	Strategies	D	E
CS	Counts on from Smaller	8(8%)	6(6%)
CL	Counts on from Larger	11(11%)	12(13%)
CA	Counts All	13(14%)	6(6%)
AA	Additive Algorithm	0(0%)	0(0%)
AL	Algorithm	59(61%)	66(69%)
HU	Heuristic	0(0%)	0(0%)
GU	Guess	0(0%)	3(3%)
UN	Uncodable	4(4%)	2(2%)
QCS	Quasi-heuristic CS	0(0%)	0(0%)
QCL	Quasi-heuristic/CL	1(1%)	1(1%)
QCA	Quasi-heuristic/CA	0(0%)	0(0%)
?		0(0%)	0(0%)
GI	Given Number	0(0%)	0(0%)
OP	Wrong Operation	0(0%)	0(0%)
AA or AL & OP		0(0%)	0(0%)

Table 16

Task 2 (Subtraction-Separating), Interview II
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	10(10%)	0(9%)
F	Fingers	--	--	2(2%)	0(0%)
H+	Horizontal Addition Sentence	0(0%)	0(0%)	1(1%)	0(0%)
V+	Vertical Addition Sentence	3(3%)	3(3%)	0(0%)	0(0%)
N	No Action	17(18%)	5(5%)	12(13%)	12(13%)
T	Tallies	--	--	5(5%)	5(5%)
H-	Horizonatal Subtraction Sentence	0(0%	C(0%)	0(0%)	0(0%)
V-	Vertical Subtraction Sentence	40(42%)	46(48%)	1(1%)	4(4%)
#	Number	2(2%)	2(2%)	0(0%)	0(0%)
H+, Z	Horizontal Addition With Other Model	--	--	0(0%)	0(0%)
V+; Z	Vertical Addition With Other Model	--	--	0(0%)	0(0%)
H-; Z	Horizontal Subtraction With Other Model	--	--	0(0%)	0(0%)
V-; Z	Vertical Subtraction With Other Model	--	--	0(0%)	7(7%)
Z; Z	Combination of Models	--	--	3(3%)	2(2%)
O	Other			0(0%)	0(0%)
Y	Correct	49(51%)	2(2%)	13(14%)	20(21%)

Table 16 (Continued)

	Error	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	15(16%)	13(14%)
F	Forgets	--	--	1(1%)	0(0%)
S	Sentence Error	3(3%)	3(3%)	1(1%)	0(0%)
BG	Buggy Error	3(3%)	47(49%)	--	--
CO	Number Fact Error	4(4%)	1(1%)	--	--
R	Representation Error	1(1%)	0(0%)	0(0%)	0(0%)

	Strategies	D	E
F	Separate from	18(19%)	20(21%)
T	Separate to	0(0%)	1(1%)
MA	Match	0(0%)	0(0%)
AO	Add on	1(1%)	1(1%)
DF	Count Down from	5(5%)	4(4%)
UG	Count Up from Given	4(4%)	3(3%)
DT	Count Down to	0(0%)	0(0%)
HU	Heuristic	0(0%)	0(0%)
GU	Guess	0(0%)	4(4%)
AL	Algorithm	57(59%)	51(53%)
AA	Additive Algorithm	0(0%)	0(0%)
UN	Uncodable	4(4%)	2(2%)
QDF	Quasi-heuristic/DF	0(0%)	1(1%)
QUG	Quasi-heuristic/UG	1(1%)	1(1%)
QDT	Quasi-heuristic/DT	0(0%)	1(1%)
?		0(0%)	1(1%)
GI	Given Number	1(1%)	0(0%)
OP	Wrong Operation	0(0%)	1(1%)
AA or AL & OP		5(5%)	5(5%)

Table 17

Task 3 (Subtraction-Part-Part-Whole), Interview II
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	8(8%)	7(7%)
F	Fingers	--	--	3(3%)	1(1%)
H+	Horizontal Addition Sentence	1(1%)	0(0%)	0(0%)	0(0%)
V+	Vertical Addition Sentence	6(6%)	4(4%)	1(1%)	2(2%)
N	No Action	14(15%)	5(5%)	9(9%)	12(12%)
T	Tallies	--	--	8(8%)	5(5%)
H-	Horizonatal Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V-	Vertical Subtraction Sentence	39(41%)	40(42%)	1(1%)	4(4%)
#	Number	1(1%)	1(1%)	0(0%)	1(1%)
H+, Z	Horizontal Addition With Other Model	--	--	0(0%)	0(0%)
V+; Z	Vertical Addition With Other Model	--	--	0(0%)	1(1%)
H-; Z	Horizontal Subtraction With Other Model	--	--	0(0%)	0(0%)
V-; Z	Vertical Subtraction With Other Model	--	--	1(1%)	8(8%)
Z; Z	Combination of Models	--	--	4(4%)	3(3%)
O	Other	--	--	0(0%)	0(0%)
Y	Correct	49(51%)	2(2%)	14(15%)	20(21%)

Table 17 (Continued)

	Error	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	12(13%)	11(11%)
F	Forgets	1(1%)	0(0%)	1(1%)	1(1%)
S	Sentence Error	7(7%)	4(4%)	3(3%)	1(1%)
BG	Buggy Error	3(3%)	39(41%)	--	--
CO	Number Fact Error	2(2%)	1(1%)	--	--
R	Representation Error	1(1%)	0(0%)	0(0%)	0(0%)

	Strategies	D	E
F	Separate from	20(21%)	19(20%)
T	Separate to	1(1%)	0(0%)
MA	Match	0(0%)	0(0%)
AO	Add on	1(1%)	1(1%)
DF	Count Down from	4(4%)	1(1%)
UG	Count Up from Given	3(3%)	5(5%)
DT	Count Down to	0(0%)	0(0%)
HU	Heuristic	0(0%)	0(0%)
GU	Guess	4(4%)	3(3%)
AL	Algorithm	51(53%)	55(57%)
AA	Additive Algorithm	0(0%)	0(0%)
UN	Uncodable	2(2%)	3(3%)
QDF	Quasi-heuristic/DF	1(1%)	0(0%)
QUG	Quasi-heuristic/UG	1(1%)	0(0%)
QDT	Quasi-heuristic/DT	0(0%)	0(0%)
?		0(0%)	2(2%)
GI	Given Number	0(0%)	0(0%)
OP	Wrong Operation	3(3%)	1(1%)
AA or AL & OP		6(6%)	8(8%)

Table 18

Task 4 (Addition-Part-Part-Whole), Interview II
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	9(9%)	6(6%)
F	Fingers	--	--	1(1%)	4(4%)
H+	Horizontal Addition Sentence	1(1%)	2(2%)	0(0%)	0(0%)
V+	Vertical Addition Sentence	45(47%)	57(59%)	0(0%)	1(1%)
N	No Action	16(17%)	8(8%)	11(11%)	10(10%)
T	Tallies	--	--	4(4%)	3(3%)
H-	Horizonatal Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V-	Vertical Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
#	Number	5(5%)	1(1%)	0(0%)	1(0%)
H+, Z	Horizontal Addition With Other Model	--	--	0(0%)	0(0%)
V+; Z	Vertical Addition With Other Model	--	--	0(0%)	0(0%)
H-; Z	Horizontal Subtraction With Other Model	--	--	0(0%)	0(0%)
V-; Z	Vertical Subtraction With Other Model	--	--	4(4%)	1(1%)
Z; Z	Combination of Models	--	--	0(0%)	0(0%)
O	Other	--	--	0(0%)	0(0%)
Y	Correct	62(65%)	58(60%)	20(21%)	15(16%)

Table 18 (Continued)

	Errors	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	5(5%)	8(8%)
F	Forgets	3(3%)	0(0%)	1(1%)	0(0%)
S	Sentence Error	0(0%)	0(0%)	0(0%)	0(0%)
BG	Buggy Error	0(0%)	4(4%)	--	--
CO	Number Fact Error	1(1%)	5(5%)	--	--
R	Representation Error	0(0%)	1(1%)	0(0%)	0(0%)

	Strategies	D	E
CS	Counts on from Smaller	4(4%)	5(5%)
CL	Counts on from Larger	11(11%)	5(5%)
CA	Counts All	10(10%)	10(10%)
AA	Additive Algorithm	0(0%)	0(0%)
AL	Algorithm	66(69%)	68(71%)
HU	Heuristic	0(0%)	0(0%)
GU	Guess	2(2%)	3(3%)
UN	Uncodable	1(1%)	2(2%)
QCS	Quasi-heuristic/CS	0(0%)	0(0%)
QCL	Quasi-heuristic/CL	1(1%)	1(1%)
QCA	Quasi-heuristic/CA	0(0%)	0(0%)
?		0(0%)	0(0%)
GI	Given Number	0(0%)	0(0%)
OP	Wrong Operation	0(0%)	0(0%)
AA or AL & OP		1(1%)	1(1%)

Table 19

Task 5 (Subtraction-Comparison), Interview II
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	9(9%)	8(8%)
F	Fingers	--	--	5(5%)	3(3%)
H+	Horizontal Addition Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V+	Vertical Addition Sentence	6(6%)	5(5%)	1(1%)	2(2%)
N	No Action	11(11%)	3(3%)	12(13%)	14(15%)
T	Tallies	--	--	5(5%)	6(6%)
h-	Horizontal Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V-	Vertical Subtraction Sentence	30(31%)	35(36%)	4(4%)	2(2%)
#	Number	1(1%)	0(0%)	2(2%)	3(3%)
H+, Z	Horizontal Addition With Other Model	--	--	0(0%)	0(0%)
V+; Z	Vertical Addition With Other Model	--	--	3(3%)	2(2%)
H-; Z	Horizontal Subtraction With Other Model	--	--	0(0%)	0(0%)
V-; Z	Vertical Subtraction With Other Model	--	--	2(2%)	6(6%)
Z; Z	Combination of Models	--	--	4(4%)	5(5%)
O	Other	--	--	0(0%)	1(1%)
Y	Correct	36(38%)	3(3%)	21(22%)	23(24%)

Table 19 (Continued)

	Error	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	11(11%)	14(15%)
F	Forgets	1(1%)	0(0%)	4(4%)	0(0%)
S	Sentence Error	16(17%)	23(24%)	9(9%)	5(5%)
BG	Buggy Error	1(1%)	35(36%)	--	--
CO	Number Fact Error	2(2%)	0(0%)	--	--
R	Representation Error	0(0%)	0(0%)	0(0%)	0(0%)

	Strategies	D	E
F	Separate from	12(13%	2(2%)
T	Separate to	0(0%)	0(0%)
MA	Match	6(6%)	0(0%)
AO	Add on	3(3%)	10(10%)
DF	Count Down from	1(1%)	0(0%)
UG	Count Up from Given	13(14%)	39(41%)
DT	Count Down to	0(0%)	0(0%)
HU	Heuristic	0(0%)	0(0%)
GU	Guess	8(8%)	3(3%)
AL	Algorithm	38(40%)	28(29%)
AA	Additive Algorithm	0(0%)	3(3%)
UN	Uncodable	2(2%)	1(1%)
QDF	Quasi-heuristic/DF	2(2%)	0(0%)
QUG	Quasi-heuristic/UG	2(2%)	3(3%)
QDT	Quasi-heuristic/DT	0(0%)	0(0%)
?		1(1%)	1(1%)
CI	Given Number	4(4%)	2(2%)
OP	Wrong Operation	2(2%)	1(1%)
AA or AL & OP		8(8%)	5(5%)

Table 20

Task 6 (Subtraction-Joining, Miss' g Addend), Interview II
Number (%) of Children Coded for a Particular Behavior

	Model	Algorithm		Non-Algorithm	
		D	E	D	E
C	Cubes	--	--	8(8%)	8(8%)
F	Fingers	--	--	12(12%)	7(7%)
H+	Horizontal Addition Sentence	0(0%)	0(0%)	1(1%)	0(0%)
V+	Vertical Addition Sentence	7(7%)	13(14%)	2(2%)	0(0%)
N	No Action	8(8%)	3(3%)	17(18%)	19(20%)
T	Tallies	--	--	4(4%)	6(6%)
H-	Horizontal Subtraction Sentence	0(0%)	0(0%)	0(0%)	0(0%)
V-	Vertical Subtraction Sentence	20(21%)	18(19%)	0(0%)	0(0%)
#	Number	2(2%)	0(0%)	5(5%)	5(5%)
H+, Z	Horizontal Addition With Other Model	--	--	0(0%)	1(1%)
V+; Z	Vertical Addition With Other Model	--	--	2(2%)	0(0%)
H-; Z	Horizontal Subtraction With Other Model	--	--	0(0%)	0(0%)
V-; Z	Vertical Subtraction With Other Model	--	--	2(2%)	4(4%)
Z; Z	Combination of Models	--	--	7(7%)	10(10%)
O	Other	--	--	0(0%)	1(1%)
Y	Correct	26(27%)	3(3%)	41(43%)	35(36%)

Table 20 (Continued)

	Error	Algorithm		Non-Algorithm	
		D	E	D	E
M	Miscount	--	--	9(9%)	17(18%)
F	Forgets	--	0(0%)	4(4%)	1(1%)
S	Sentence Error	1(1%)	17(18%)	4(4%)	12(13%)
BC	Buggy Error	2(2%)	20(21%)	--	--
CO	Number Fact Error	2(2%)	0(0%)	--	--
R	Representation Error	1(1%)	0(0%)	0(0%)	0(0%)

	Strategies	D	E
F	Separate from	2(2%)	5(5%)
T	Separate to	0(0%)	0(0%)
MA	Match	0(0%)	0(0%)
AO	Add on	10(10%)	12(13%)
DF	Count Down from	0(0%)	0(0%)
UG	Count Up from Given	39(41%)	30(31%)
DT	Count Down to	0(0%)	1(1%)
HU	Heuristic	0(0%)	3(3%)
GU	Guess	3(3%)	3(3%)
AL	Algorithm	28(29%)	22(23%)
AA	Additive Algorithm	3(3%)	1(1%)
UN	Uncodable	1(1%)	2(2%)
QDF	Quasi-heuristic/DF	0(0%)	1(1%)
QUG	Quasi-heuristic/UG	3(3%)	4(4%)
QDT	Quasi-heuristic/DT	0(0%)	0(0%)
?		0(0%)	1(1%)
GI	Given Number	0(0%)	0(0%)
OP	Wrong Operation	1(1%)	6(6%)
AA or AL & OP		6(6%)	11(11%)

table. The model and error data are reported for children who solved the tasks algorithmically, and for those who solved them non-algorithmically. In Interview I about 25% of the tasks were solved algorithmically; in Interview II, 50% were solved algorithmically.

For tasks solved non-algorithmically, combinations of models such as horizontal addition sentence (H+) and cubes (C), were possible. However, due to small n's, these categories were collapsed. For example, H + Z represents H+ and cubes, H+ and fingers, and H+ and tallies. Use of two models such as cubes (C) and fingers (F), make up the category 2. The uncodable (UN) and confused (?) responses are included in the strategy category.

Conclusion

This is the first of two reports on the data from the second phase of the individual interviews for the longitudinal study. Each report contains data for two rounds of interviewing. For subsequent and previous reports in the individual interview series and for additional information and reports concerning the longitudinal study, contact the Mathematics Work Group at the Wisconsin Research and Development Center for Individualized Schooling, Madison, Wisconsin.

Reference Notes

1. Kouba, V. L., & Moser, J. M. Development and validation of curriculum units related to initial sentence writing (Technical Report No. 522). Madison: Wisconsin Research and Development Center for Individualized Schooling, October, 1979.

2. Kouba, V. L., & Moser, J. M. Development and validation of curriculum units related to learning of addition and subtraction algorithms (Working Paper No. 287). Madison: Wisconsin Research and Development Center for Individualized Schooling, 1980.

3. Moser, J. M. Young children's representation of addition and subtraction problems (Theoretical Paper No. 74). Madison: Wisconsin Research and Development Center for Individualized Schooling, May, 1979.

4. Carpenter, T. P., & Moser, J. M. An investigation of the learning of addition and subtraction (Theoretical Paper No. 79). Madison: Wisconsin Research and Development Center for Individualized Schooling, November, 1979.

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APPENDIX A

PROBLEM TASKS BY LEVEL

D

1. Addition-simple joining

Michael has _____ toy cars. His mother gave him _____ more toy cars. How many toy cars did Michael have altogether?

D

2. Subtraction--simple separating

Terry had _____ pictures. She gave _____ pictures to Joe. How many pictures did Terry have left?

D

3. Subtraction--part, part, whole missing addend

There are _____ cartons of milk. _____ are chocolate and the rest are white. How many cartons of white milk are there?

D

4. Addition-part, part-whole

Jane has _____ red flowers. She also has _____ yellow flowers. How many flowers does Jane have altogether?

D

5. Subtraction--difference

Sue has _____ fishing worms. Her friend Ted has _____ fishing worms. How many more worms does Ted have than Sue?

D

6. Subtraction--simple joining missing addend

Robert has ___ coins. How many more coins does he have to put with them to have _____ coins altogether?

E

1. Addition--simple joining

Sara has _____ records. Her brother gave her _____ more records. How many records does Sara have altogether?

E

2. Subtraction--simple separating

Todd had _____ jelly beans. He gave _____ jelly beans to Phillip. How many jelly beans did Todd have left?

E

3. Subtraction--part, part, whole missing addend

There are _____ mice in a cage. _____ are male and the rest are female. How many female mice are in the cage?

E

4. Addition--part, part, whole

Mary has _____ large shells. She also has _____ small shells. How many shells does Mary have altogether?

E

5. Subtraction--difference

Pat has _____ cards. His friend Jenny has _____ cards. How many more cards does Jenny have than Pat?

E.

6. Subtraction--simple joining missing addend

Don has _____ paper airplanes. How many more paper airplanes does he have to put with them to have _____ altogether?

D

1. Addition-simple joining

Sheila had _____ plastic animals.

Her friend gave her _____ more plastic animals.

How many plastic animals did Sheila have altogether?

D

2. Subtraction-simple separating

Bryan had _____ pennies.

He gave _____ pennies to Lois.

How many pennies did Bryan have left?

D

3. Subtraction-part, part, whole missing addend

There are _____ horses at the fair.

_____ are white and the rest are black.

How many black horses are there at the fair?

D

4. Addition-part, part, whole

Karen has _____ big rocks.

She also has _____ little rocks.

How many rocks does Karen have altogether?

D

5. Subtraction-comparison

Norman has _____ cans.

His friend Bill has _____ cans.

How many more cans does Bill have than Norman?

D

6. Subtraction-simple joining missing addend

Kathy has _____ pictures.

How many more pictures does she have to put with them to have _____ pictures altogether?

E

1. Addition-simple joining

Bruce had _____ fish.

His brother gave him _____ more fish.

How many fish did Bruce have altogether?

E

2. Subtraction-simple separating

Jean had _____ girl scout cookies.

She gave _____ cookies to Rich.

How many cookies did Jean have left?

E

3. Subtraction-part, part, whole
missing addend

There are _____ children on the swim team.

_____ are girls and the rest are boys.

How many boys are on the swim team?

E

4. Addition-part, part, whole

Mr. Smith has _____ old golf balls

He also has _____ new golf balls.

How many golf balls does Mr. Smith have altogether?

E

5. Subtraction-comparison

Molly has _____ honey bees.

Her sister Linda has _____ honey bees.

How many more bees does Linda have than Molly?

E

6. Subtraction-simple joining
missing addend

Tim has _____ seeds.

How many more seeds does he have to put with them to have _____ seeds altogether?

APPENDIX B

INDIVIDUAL STUDENT PROFILES

T D

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
101							
1	D	H+ Y AL –	V- Y AL –	V- Y AL –	V+ Y AL –	V- N AL CO	V- Y AL –
	E	V+ N AL CO	V- N AL R	H+ N AL/OP S	H+ N AL CO	V- N AL BG	V- N AL BG
2	D	N N UN –	V- N AL F, BG	C N F M	V+ Y AL ..	V- Y AL –	V- N AL F
	E	V+ Y AL –	V- N AL BG	V- N AL BG	V+ Y AL –	V- N AL BG	V- N AL BG
102							
1	D	F N CS M	T Y F –	T N GU –	N Y AL –	N N OP O	N N GL –
	E	C Y CA –	N N C .	N N GU –	N N GL –	N . . –	N N GL –
2	D	T Y CA –	N Y DF –	T N OP O	N Y AL –	V+ N N/OP O	F,# Y UG –
	E	V+ N AL CO	. N GU –	V+ N GU S	V+ Y AL –	# N GU –	# Y UG –

D E Individual Profile Sheet

nt.	103	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	T Y CL -	C Y F -	C N UN -	C N CLM	C,F ? ? -	C Y AO -
	E	C Y CL -	C Y F -	- ? ? -	C Y CL -	T Y F -	T N AC M
2	D	C Y CL -	C Y F -	C L F -	C Y CL -	C N F F	C N F F
	E	N N CS M	N N DF M	T Y F -	F N CL M	T Y F -	T N F M

	104						
1	D	C N CA M	C Y F -	- ? ? -	C N CA M	T,# Y F -	T,# N AC M
	E	T,# Y CA -	T,# N CP O	T,# N F M	T,# Y CA -	T,# N F M	T,# N AC M
2	D	C Y CA -	C # N F M	C,# Y F -	C,# N CA M	N N UC -	T Y UC -
	E	# Y CX CL -	V- ? ? -	# N UN -	# Y UN -	# N C M	N N HU -

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
	105						
1	D	F Y CS -	C Y F -	C N F M	C Y CA -	C, F N M -	F N UG M
	E	F N UN -	C N F F	N N DF M	F Y CL -	N N GL -	F Y UG -
2	D	N N CL M	N Y DF -	V- Y AL -	F Y CS -	F N UG M	F N UG M
	E	V+ Y CS -	F,V- N DF M	T,V- Y F -	F Y CS -	F N UG M	F N UG M
	106						
1	D	C Y CA -	T,V- Y F -	T Y F -	F Y CL -	T Y F -	T N UN -
	E	F N CL M	T Y F -	T Y F -	F N CL M	T Y F -	T Y F -
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V- N AL CG
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL BG	V- N AL BG
	107						
1	D	C N CA M	C N F M	C Y F -	C N CA M	C N MA F	C N UN -
	E	+- N CL M	T N F M	T,# N F M	T,# Y CA -	T N MA M	T,# N MA M
2	D	C N CA M	C N F M	C N F M	C Y CA -	C Y MA -	C Y AC -
	E	F N CL M	C N F M	C Y F -	C N CA M	C N MA M	C Y AC -

D E Individual Profile Sheet

ID

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1 D	102	C Y CA -	C Y F -	C N F M	C N CA M	C N MA F	C,F Y AO -
1 E		T Y CS -	T N F M	T N F M	T Y CA -	T N MA M	T Y AO -
2 D		C N CA M	C N F M	C N F M	C N CA M	C N MA M	F Y UG -
2 E		T N CA M	T Y F -	T [illegible] -	T Y CA -	T N MA M	T Y UG -
1 D	109	C Y CL -	C N F F	C N OP O	C Y CL -	N N GI GI	F N UG M
1 E		C N CL M	C Y F -	C Y F -	C Y CL -	N N GI GI	F N UG M
2 D		V+ Y AL -	V- N AL R	V+ N AL/OP O,S	V+ Y AL -	V+ N AL/OP O,S	V+ N AL/OP O,S
2 E		V+ N AL BG	V- N AL BG	V+ N AL/OP O,S	V+ N AL BG	V+ N AL/OP O,S	V+ N AL/OP O,S
1 D	111	C N CA M	C Y F -	C [illegible] F M	F,# Y CL -	C [illegible] -	T,# N [illegible]
1 E		T,# Y CL -	T,# Y F -	T,# Y F -	T,# Y [illegible]	T,# Y F -	C,# N AO [illegible]
2 D		C,F Y CL -	T N F M	[illegible] F M	C,F Y CL -	T N F M	F [illegible]
2 E		C,F Y CL -	T N F M	T N DT M	V+ Y AL -	V- N AL BG	C,# Y UG -

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	C Y CA -	T Y F -	T,H- Y F -	H+,T Y CA -	H+ Y HU S	F N UN -
	E	H+,T Y CA -	T,H- Y F -	T,H- Y F -	H+ Y CA -	H+,T N OP O.S	N N GU -
2	D	V+ Y AL -	V- Y AL -	C,V- N F M	V+ Y AL -	F,A- Y UG S	# Y UG -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S.BG	V+ N [illegible] O.S
1	D	C Y CL -	C Y F -	C N F M	T Y CL -	T Y AD -	C N AO M
	E	C N CL M	T Y F -	T N U.V -	C Y CL -	C Y MA -	F,T Y UG -
2	D	T Y CS -	C Y F -	T Y F -	T Y CL -	F Y UG -	F N UG M
	E	F Y CL -	T Y F -	T Y F -	F Y CL -	T Y F -	F N UG M
1	D	C Y CA -	C N F F	C N F M	F N UN -	C Y MA -	N N GU -
	E	N N GU -	N N GU -	C Y F -	C N CH -	N N GU -	N N GU -
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	C N CA M	C Y MA -	C Y AD -
	E	V+ Y AL -	C N F M	C N F M	V+ Y AL -	C Y MA -	F N UG M

D E Individual Profile Sheet

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	114 D	T Y CA –	T Y F –	T Y F –	T Y CS –	T Y MF –	T Y AO –
	E	F N CL M	F N OF M	T Y MA –	T N CL M	T Y MA –	T Y AO –
2	D	T,# Y CA –	V– N AL/OP F,O	V+ N AL/OP O,S	V+ Y AL –	V– N AL/OP O,S	V+ N AL/OP O,S
	E	V+ Y AL –	V– N AL BG	V– N AL BG	V+ Y AL –	V– N AL BG	V+ N AL/OP O,S
1	115 D	T N CL M	T N F M	T Y F –	T N OP O	T N F M	T N F M
	E	T Y CS –	T N F M	T N OP O	T Y CL –	T N F M	T,# N OP O
2	D	T Y CL –	T N F M	T N F M	T Y CA –	T Y F –	T Y AO –
	E	T N CF M	T Y F –	T N F F	T Y CA –	T N F M	T Y AO –
1	116 D	H+T Y CA –	H– Y F –	F,H– N F F,S	T,# N CA Y	T,# N F M	F Y UG –
	E	T,# N CA M	T,# N F M	F,# N UG M	T,# Y CL –	F,# N UG M	F N UG M
2	D	T Y CA –	T,# Y F –	T,# Y F –	T,# Y CA –	C,# Y F –	F N UG F
	E	T,# Y CA –	T,# N F M	T,# N F M	C,# Y CA –	C,# Y F –	T,# N UG M

D E Individual Profile Sheet

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pt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
117							
1	D	V+ Y AL –	V– Y AL –	V– Y AL –	V+ Y AL –	C,# N AO M	V– Y AL –
	E	C,V+ Y CA –	C,V– Y F –	C,V– Y F –	V+ Y AL –	C,# Y F –	C,# Y AO
2	D	V+ N AL R	V– Y AL –	V– Y AL –	V+ Y AL –	V– Y AL –	V+ N AL/OP 0,S
	E	V+ Y AL –	C,V– Y F –	C,V– Y F –	V+ Y AL –	C,V– Y F –	C,V– Y F–
118							
1	D	N Y QCL –	N Y QUG –	N Y QUG –	N Y QCL –	N Y QUG –	N Y QUG–
	E	N Y QCL –	N Y QUG –	N N QUG F	N Y QCL –	N Y QUG –	N Y QUG–
2	D	N Y QCL –	N Y AL –	N Y AL –	N Y QCL –	N Y QUG –	N Y QUG–
	E	N Y QCL –	N Y QDT –	N Y QUG –	N Y QCL –	N Y QUG –	N Y QUG–
119							
1	D	C N CA M	C N F M	– ? ? –	C Y CA –	– ? ? –	– ? ? –
	E	C N CA –	T Y F –	T N F F	T N HU –	N N GU –	C N AS–
2	D	T Y CA –	T Y F –	T N F M	C Y CA –	N N GT GT	C Y AO–
	E	C Y CA –	C Y F –	C N F M	C N CA M	C ? ? –	C N AC

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D E Individual Profile Sheet

nt.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	120 D	C N CS M	C Y F -	C Y F -	C Y CA M	C N OP O	N N GU -
	E	N N GU -	N N GU -	N N GU -	N N CL M	N N UG M	N N UG -
2	D	N N AL BG	N N AL BG	T Y F -	C Y C -	T Y F -	N Y UG -
	E	N N AL BG	C N F M	N N DF M	N N CL M	N N UG M	N Y UG -
1	121 D	C,# N CA M	C,# Y F -	F,# Y UG -	F,# N CL M	F,# Y UG -	F,# Y UG -
	E	# N GU -	F,# N UG M	F,# Y UG -	F,# N CS M	F,# Y UG -	F,# N UG M
2	D	T Y CS -	F Y AO -	F Y AO -	T Y CL -	F,# Y AO -	F Y AO -
	E	T,# Y CA -	F,# N AO M	F Y AO -	F,# N AL M	F,# N AO M	F# Y AO -
1	123 D	V+ Y AL -	V- Y AL -	N Y HU -	V+ Y A -	T Y UG -	N Y HU -
	E	V+,T N CL M	V- N AL BG	V- N AL BG	V+,T Y CL -	V- N AL BG	T,# N UG M
2	D	V- Y AL -	V- Y AL -	V- Y A -	V- Y A -	V- Y T_S	N Y U -
	E	V+ Y AL -	V- Y DF -	F,- Y DF -	V+ Y A_ -	V- N AL BG	N N A_ BG

nt.		124 Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL S	V- Y AL S
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S, BG	V- N AL S, BG
2	D	C Y CS -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL S	V- Y AL S
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S, BG	V- N AL S, BG

		125					
1	D	C N CA M	C N F M	C N F M	C Y CA -	H+ N UG M, S	C N AO M
	E	C Y CA -	C N F M, F	C N F M, F	C N CA M	H+ N UG F, S	C N OP O
2	D	V+ Y AL -	V- N AL CO	V- N AL BG, R	V+ Y AL -	V- N AL S, CO	V- N AL S, CO &
	E	V+ N AL BG	V- N AL BG	V- N AL BG, CO	V+ N AL 36	V- N AL S, BG	V+ N AL OP O, S

		127					
1	D	V+ N AL F	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL S	F V- Y UG -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL BG	V- N AL BG
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V- Y AL -
	E	V+ Y AL -	C, V- Y F -	V- N AL BG	V+ Y AL -	C V- Y F -	C, V- N F -

D E Individual Profile Sheet

ID

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	V+ Y AL -	F, V- Y UG -	V+ N AL/OP O,S	V+ Y AL -	F Y UG -	F, # Y UG -
	E	V+ Y AL -	F, V+ Y UG S	V+ N CI GI, S	V+ Y AL -	F, V- Y UG S	F, # Y UG M
2	D	V+ Y AL -	V- N UG M	N N GU -	V+ Y AL -	F Y UG -	F Y UG -
	E	V+ Y AL -	V- N AL BG	V- N GU -	V+ Y AL -	F, V- Y UG -	F, V- Y UG -

29

1	D	N Y CS -	N N GU -	N N GU -	N Y CS -	N N UG M	N N UG M
	E	N Y CS -	N Y UG -	C Y UG -	N Y CS -	C Y UG -	N Y UG M
2	D	N N CL, M	F N UG M	N N UG M	N Y CS -	N UG M	F Y UG -
	E	N N CS M	N N UG M	N N UG M	N Y CS M	C N UG M	C Y UG -

30

1	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -
	E	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -
2	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -
	E	N Y AL -	CV- Y F -	V- Y F -	N Y AL -	CV- Y F -	N Y QUG -

it.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
	131						
1	D	C,H+ N CA M	C,H- Y F -	T,H- Y F -	C,H+ Y CA -	F N UG M	F Y UG -
	E	C Y CS -	C,V- Y F -	C Y F -	N Y CS -	C Y MA -	F Y UG -
2	D	V+,H- Y AL -	H-,V- Y AL -	V- Y AL -	V+ Y AL -	V+ N OP O	N Y UG -
	E	N N CL F	V- N AL BG	V- N AL BG	V+ N AL R	N N UG F	N Y UG -
	132						
1	D	N Y AL -	N Y AL -	N Y UN -	N Y AL -	V- Y AL -	F Y UG -
	E	N Y AL -	N Y QDF -	V- N AL BG	V+ Y AL -	F N F M	N Y QUG -
2	D	N Y AL -	N N DF M	V- Y DF -	N Y AL -	V- Y AL -	V- Y AL -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	N Y AL -	V- N AL BG	N Y QUG -
	133						
1	D	C N CL M	C Y F -	C Y F -	C N CL M	C N OP O	T Y AO -
	E	T Y CS -	T N F M	T N F M	# Y CL -	N N GI GI	T,# N UG M
2	D	C Y CA -	C,# N F M	C N F M	C Y CL -	# N GI GI	C# Y UG -
	E	C N CL M	C Y F -	C N F M	C Y CA -	C N GI GI	C Y AO -

D E Individual Profile Sheet

ID	Int.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
[illegible]	1	D	N N UN -	C N OF M	? N OP O	N N GU -	N N GU -	N N UN -
		E	N N GU -	N V GU -	N N UN -	N N GU -	N N GI GI	N N GU -
	2	D	N N UN -	N N UN -	N V UN -	N N GU -	N ? ? -	N N UG F
		E	N N CS M	N N UN -	N N GU -	N N CS M	N N GU -	N N GU -
135	1	D	C,H+ Y CA -	C,H- N F M	C,H+ N OP O,S	C,H+ Y CA -	C,H+ N UG M,S	C,H+ Y F -
		E	C,H+ N CA M	C,H- Y F -	C,H+ N OP O,S	C,H+ Y CA -	C,H+ N UG M,S	C,H+ N UG M,S
	2	D	V+ Y AL -	V- Y AL -	V+ N AL S,BG	V+ N AL F	V,T N UG F,S	V+,T Y UG S
		E	V+ N AL BG	V- N AL BG	V+ N AL/OP O,S	V+ Y AL -	V+T Y UG S	T,# Y UG -
137	1	D	C Y CL -	F Y [illegible]	F N UG M	F Y C - -	F N UG M	F Y UG -
		E	C Y CL -	C Y F -	C Y F -	C Y [illegible]	F N UG M	F Y UG -
	2	D	V+ Y AL -	V- [illegible] A -	V- Y AL -	V+ Y A -	V Y AL S	F,# Y [illegible]
		E	V+ N AL CO	V- N A- BG	V- N AL BG	V+ Y AL -	V- N A- BG	T,# N UG M

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D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
139							
1	D	C Y CA -	C N F M	C Y F -	C Y CA -	C Y MA -	C Y AO -
	E	C Y CL -	C N F M	C Y F -	C N CA M	C Y MA -	C Y AC F
2	D	T N CA M	T N F M	T N F M	I I CA -	T N F F	T Y AO -
	E	T Y CS -	T N F M	T Y F -	T Y CA -	T Y MA -	T Y AO -
140							
1	D	C Y CA -	C Y F -	F Y DF -	N N CS -	N N GI GI	C Y UG -
	E	T Y CA -	T Y F -	T Y F -	T Y CA -	N N GI GI	T Y F -
2	D	C Y CL -	C N F M	V- N ALOP O	N Y CL -	N N GI GI	N Y UG -
	E	V+ Y AL -	C Y F -	V- N ALOP O	V+ Y AL -	N N GI GI	C N AO M
141							
1	D	- ? ? -	N N OP O	N N UG M	I I CS M	N N UG F	- ? ? -
	E	N N CL -	N N GI -	- ? ? -	N Y GU -	N N LG -	- ? ? -
2	D	N N UN -	N N UN -	N N UN -	N U U -	N N U -	N N UN -
	E	N Y UN -	N Y UN -	N N UN -	N U -	N N U -	N N UN -

D E Individual Profile Sheet

Int.	ID		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	143	D	F Y CL -	C N F M	C N F M	F Y CL -	C Y MA -	F Y UG -
		E	F N CL M	C Y F -	C Y F -	F Y CL -	C Y MA -	C Y AO -
2		D	C N CL M	C N F M	V- N AL CO	N Y CL -	C Y F -	N Y UG -
		E	N N CL M	C N F M	C Y F -	O Y CL -	C Y F -	C N AO M
1	144	D	F N UN -	N N GU -	F,V- Y F -	N N GU -	N Y UG -	N Y #F -
		E	F Y UN -	N N GU -	N N GU -	N N GU -	N N GU -	N N GU -
2		D	H+,T Y CS -	H+ Y UN -	H+ Y AL S	H+ Y AL -	V+,T Y UG S	N N GU -
		E	V+ N CL M	V+ N AL S,BG	V+ N UN -	V+ N GU -	V+ N GU S	# Y HU -
1	147	D	F Y CS -	F Y UG -	F Y UG -	F N CS M	F N UG M	F Y UG -
		E	F Y CS -	F N UG M	F Y UG -	F Y CL -	F Y UG -	F Y UG -
2		D	# Y AL -	# Y AL -	V- N AL F	# Y AL -	F,# N UG Y	F,# Y UG -
		E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S,BG	# N UGM

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
148							
1	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y UN -	N Y AL -
	E	N Y AL -	V- Y UN -	N Y QDF	# Y AU -	N Y QUG-	V- Y UG -
2	D	N Y AL -	N Y QUG-	V- Y AL -	N Y AL -	N Y FL -	N Y QUG-
	E	N Y AL -	N Y QDF-	N Y QDF-	N Y AL -	N Y QDF-	N Y QDF-
151							
1	D	N N GU -	F N DF M	F N UN -	N N GU -	N N GU -	N Y UN -
	E	C,H+ N CA M	C N F F	N N UN -	N N CA M	N N UN -	N N UN -
2	D	N N CS M	N N DF F	N N GU -	N Y CL -	N Y UG -	N N UG -
	E	N N GU -	N N DF M	N N UN -	N N CS M	N N GU -	N N UG -
152							
1	D	C,H+ N CL M	C,H- N F M	C N F M	C N CL -	C,F ? ? -	C,H- N OP O
	E	C,H+ N CS M	C N F M	C,H- N F M	C,H+ Y CS -	C,H- N OP O,S	C,H+ N OP O,
2	D	C,H+ Y CS -	V- Y AL -	V- Y AL -	V+ Y AL -	V- N AL S,CO	T Y UG -
	E	V+ N AL BG	V- N AL OP O	V- N AL BG	V+ N AL BG	V- N AL S,BG	V+ N AL B

D E Individual Profile Sheet

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1 D	153	F Y CL -	T N F M	F N F M	F N CL M	C Y F -	F N UG Y
1 E		T N CA M	C N F M	T Y F -	T Y CA -	C,# N F M	T Y AO -
2 D		N N AL R	V+ N AL/OP O,S	V+ N AL/OP O,S	N Y AL -	C,# N MA M	C Y UG -
2 E		V+ Y AL -	V- N AL BG	T,# N F M	N N AL CO	T N F M	T N AO M
1 D	154	V+ Y AL -	V- Y AL -	V+ N AL/OP O,S	V+ Y AL -	V+ Y UG S	# Y UG -
1 E		V+ Y AL -	V- Y AL -	V- N AL BG	V- Y AL -	V- N AL S, BG	V- N AL BG
2 D		V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL S	V+ N AL/OP O,S
2 E		V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S, BG	V- N AL SB
1 D	155	N Y GV -	N N GD -	F Y UG -	N Y AL -	N Y UG -	N Y UG F
1 E		N Y AL -	N Y UG -	N N GV -	N Y AL -	N N UG F	N Y UG -
2 D		N Y AL -	N Y UG -	F N UG Y	N N CL F	N N UG Y	N Y UG -
2 E		N Y AL -	N N AL BG	N N AL BG	N N AL BG	N N AL BG	N N AL BG

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
158							
1	D	V+,T Y CL -	T,V- Y F -	T,V- Y F -	V+,T Y CL-	T,V- N MA M	V+,T Y UG-
	E	V+,T Y CL-	T,V- N F M	T,V- Y F -	V+,T Y CL-	T,V- Y MA S	V+,T Y UG-
2	D	V+ Y AL-	V- Y AL-	V- Y AL-	V+ Y AL-	C Y MA -	F,# Y UG-
	E	V+ Y AL-	C,V- Y F -	C,V- Y F -	V+ Y AL-	C,V- N MA M,S	F Y UG-
159							
1	D	T Y CL -	F N QUG F	F N UG M	T Y CL -	F N UG M	T N UG M
	E	T N CL F	T N F M	T N F M	T N CA M	T N UG M	T Y UG-
2	D	N Y AL-	N N AL BG	N N A- BG	N N AL F	N N AL BG	V- Y AL S
	E	N N AL BG	N N AL BG	N N AL BG	N Y AL -	N N AL BG	N N AL BG
160							
1	D	F N HU F	N N QDF -	F Y Q DF -	F Y CL -	N Y UG -	N N UN -
	E	F Y HU -	N Y UN -	N N Q DF -	F N CS -	N N QUG -	N N QUG -
2	D	N N CL -	# Y AL -	# Y AL -	# N AHOP ?	# Y AL -	F Y UG -
	E	# N CL -	# N AL BG	# ? ? -	N Y HU -	# N GU -	N Y UG -

D E Individual Profile Sheet

nt.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	162 D	# Y CL -	N N DF M	N N UG M	N Y AL -	T,# Y UG -	T,# Y UG -
	E	N Y AL -	T Y F -	T N F M	T Y CA -	F,T, Y UG -	F,T Y UG -
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y QUG S	# Y QUG -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S,BG	V+ N AL S,BG
1	163 D	F,# Y CL -	H- N UG M	H- Y UG -	V+ Y AL -	V- Y AL S	V+ Y UG -
	E	V+ Y AL -	V- N AL BG	V- Y UG -	V+ Y AL -	V- Y UG S	N Y UG -
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y UG S	V- Y AL -
	E	V+ Y AL -	V- Y UG -	V- Y QUG -	V+ Y AL -	V- N QUG M	# Y QUG -
1	164 D	F Y CL -	C Y F -	C Y F -	F Y CL -	T Y F -	F Y UG -
	E	F Y CL -	T,# N F F	T,# Y F -	F Y CL -	T Y F -	T Y UG -
2	D	T N CA M	T Y F -	T# Y F -	T,# N CS M	T Y F -	T Y AO -
	E	T,# Y CL -	V,# N AL BG	V- N AL BG	V+ Y AL -	V- N AL BG	T Y AO -

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
165							
1	D	C N CA M	C N F F	C N F F	C N UN-	N N GI GI	F Y UG-
	E	C Y CA -	C Y F -	C Y F -	C Y CA -	N N GI GI	C Y OP O
2	D	C N CA M	N N DF F	C N F F	N Y AL -	C N F M	C Y AO-
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ N AL CO	V- N AL S,BG	C N A O F
166							
1	D	V+ N AL R	T,V- N F M	T,V- Y F -	V+ Y AL -	T,V- N OP O	V- Y AL -
	E	V+,T N CA M	V- N AL BG	V- N AL BG	C,V+ Y CL -	V- N AL BG	C,F N MA M
2	D	C Y CA -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V- Y AL -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL BG	C,V- ? ? -
167							
1	D	C Y CL -	T,H- N OP O	H+ Y UG S	H+ Y CS -	H+ Y UG S	C,H+ N OP O,S
	E	H+ N HU M	C,H- Y F -	C,H- Y F -	H+ Y CL -	C,F N OP O,S H+	C,H+ Y AO S
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V+ N AL/OP O,S	V+ N AL S,B
	E	V+ Y AL -	V- N OP O	C,V- N F M	V+ Y AL -	V+ N AL/OP O,S	# Y UG -

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D E Individual Profile Sheet

ID

Int.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	N Y QCL -	N N UG F	N Y UN -	N Y CL -	N N OP O	N Y UG -
	E	N Y CL -	N Y QDF -	N N UN -	N Y CL -	N N OP O	N N UG -
2	D	N Y CS -	N N UG M	N N UG M	N Y CL -	N N OP O	N Y UG -
	E	N Y CS -	N Y UG -	N N UG M	N Y CS -	N N OP O	N Y UG -

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1	D	F N CL F	C Y F -	C,# N F M	F Y CL -	C,# Y F -	F,# Y UG -
	E	F,# N CL M	C,# Y F -	C,# Y F -	F Y CL -	C,# Y F -	C,# Y UG -
2	D	N Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V+ N UG N
	E	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	T,# Y UG -

170

1	D	C,H+ N CA M	H+ N GU -	H- N GU -	H+ N CS M	# N GU -	H+ N GU S
	E	N N GI GI	N N GU -	N N GU -	N N GU -	N N GU -	N N GU -
2	D	V+ Y AL -	V+ N AL/OP C,S	V+ N AL/OP C,S	V+ Y AL -	V+ N AL/OP C,S	# N [illegible]
	E	N N GU -	N N GU -	N N GU -	N N GU -	N N GU -	N N GU -

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
		|7|					
1	D	T N CA M	C N F M	T N F M	C N OP O	T N F M	T Y F -
	E	T N CL M	T N F M	T N F M	F Y CL -	T N F M	T Y F -
2	D	T F N CA M	C Y F -	C Y F -	C Y CA -	C Y F -	C N F M
	E	C Y CA -	C Y F -	C Y F -	C N CA M	C Y F -	C Y F -
		|72|					
1	D	N Y AL -	F, H - Y UG -	F, H - Y UG -	N Y AL -	F Y UG -	F Y UG -
	E	N Y AL -	F, H - Y UG -	F Y UG -	N Y AL -	# Y UG -	F, # N UG
2	D	N Y AL -	N Y AL -	N N AL CO	N Y AL -	N Y AL -	N Y AA -
	E	N N AL CO	N N AL BG	N N AL BG	F Y CL -	F Y UG -	F Y UG -
		|73|					
1	D	H+ Y AL -	H - Y HU -	# Y UG -	H+ Y AL -	H+ N UN S	H+ N UG S
	E	H+ Y AL -	H - N UG M	# N U.N -	H+ Y AL -	F, H+ Y UG S	H+ N AL/OP O,S
2	D	V+ Y AL -	V - N AL CO	V - Y AL -	V+ Y AL -	C, V - N UG M.S	C.V+ Y UG S
	E	V+ Y AL -	V - N AL BG	C.V - Y UG -	V+ Y AL -	C # Y UG -	C, # Y UG -

D E Individual Profile Sheet

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	N Y AL -	V- Y AL -	V- N AL -	V+ Y AL -	V- Y AL -	V- Y AL -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ N AL F	V- N AL BG	V- N AL BG
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	# Y AL -	V- N UN -	# Y AL -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S BG	V- N AL S B
	177						
1	D	F N CS M	T Y F -	T F -	F N CS M	F Y UG -	F Y UG -
	E	F Y CL -	F N DF M	T Y F -	F N CS M	F N UG M	N N L G M
2	D	V+ Y AL -	V- N AL CO	V- Y AL -	V+ Y AL -	V- N UG M S	# Y UG -
	E	V+ N AL BG	V- N AL BG, CO	V- N AL BG	V+ N AL BG	U+T Y UG S	T, # N UG M
	301						
1	D	C Y CA -	C Y F -	F Y UG -	C N CA M	N Y UG -	F Y UG -
	E	C Y CA -	C N AC M	N N HU -	N N A CO	N N UN -	F Y UG -
2	D	C N CL M	C Y F -	V- Y AL -	V+ N AL F	V- Y AL -	N N UG M
	E	C Y CL -	C N F M	C N F M	C Y CA -	C N AO M	N N UG M

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D E Individual Profile Sheet

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	V+ N AL R	V- Y AL-	V- Y AL-	V+ Y AL-	V- Y AL-	V- Y AL-
	E	V+ Y AL-	V- N AL BG	V- N AL BG	V+ Y AL-	V- N AL BG	V- N AL BG
2	D	V+ Y AL-	V- Y AL-	V- Y AL-	V+ Y AL-	V- Y AL-	V- Y AL-
	E	V+ Y AL-	V- N AL BG	V- N AL BG	F,V+ Y AL-	V- N AL BG	V- N AL BG
	303						
1	D	N Y AL-	V- Y AL-	V- Y AL-	V+ Y AL-	V- Y AL-	V- Y AL-
	E	V+ Y AL-	V- Y AL-	V- Y AL-	V+ Y AL-	V- Y AL-	V- Y AL-
2	D	V+ Y AL-	V- Y AL-	V- Y AL-	V+ Y AL-	V- Y AL-	V- Y AL-
	E	V+ Y AL-	V- Y AL-	V- Y AL-	V+ Y AL-	V- Y AL-	V- Y AL-
	304						
1	D	V+ Y CL-	C,V- Y F-	V+ N OP O,S	C,V+ Y CA-	V+ N OP O,S	V+ N OP O,S
	E	C,V+ N CA M	C,V- N F M	V+ Y U.V-	C,V+ Y CA-	V+ ,V OP O,S	C,V+ N OP O,
2	D	V+ Y AL-	V+ N AL/OP O,S	V+ N AL/OP O,S	# Y AL-	V+ N AL/OP O,S	V+ N OP O,S
	E	C Y CL-	V+ N AL/OP O,S	V+ N AL/OP O,S	V+ Y AL-	V+ ,V U.V-	V+ N AL/OP O,S

D E Individual Profile Sheet

It.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
305							
1	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y [illegible] -
	E	H+ N AL CO	C,H- Y F -	H- N QDF -	H+ Y AL -	H- N AL EGH	H- N QDF -
2	D	N Y AL -	N Y AL -	N Y AL -	N N AL CO	N Y AL -	N Y AL -
	E	N Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- Y AL BG	V- N AL BG
306							
1	D	H+ N CL M	C N F M	C Y F -	C,H+ N CA M	C N OP O	C Y AO -
	E	C N CL M	C,H- N F M	C N OP O	C,H+ N CS,M	C N OP O	C N OP O
2	D	N Y UN -	C N F M	C Y F -	C N CA M	F N UN -	N N UG F
	E	V+ Y AL -	V- N AL -	V+ N AL/OP O,S	V+ Y AL -	V+ N AL/OP O,S	N Y UG -
307							
1	D	T Y CA -	T N F M	T Y F -	T Y CA -	C N UG M	T Y F -
	E	C Y CA -	C Y F -	C Y F -	C Y CA -	T N AO M	T N F M
2	D	N Y AL -	C N F M	T Y F -	V+ Y AL -	V- N AL -	V+ N AL/OP O
	E	V+ Y AL -	V+ N AL/OP O,S	V- N AL BG	V+ Y AL -	V+ N AL/OP O,S	V+ N AL/OP O

D E Individual Profile Sheet

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1 D	302	T N CL M	T N F M	T Y F –	N N CL M	T N T M	N Y UG –
1 E		N Y CL –	C Y F –	C N F M	N Y CL –	C Y F –	C Y AO –
2 D		N Y CL –	N N UN –	N N UN –	N Y CS –	N N UN –	N N UG M
2 E		V+ N AL R	V- N AL BG	N N GU –	V+ Y AL –	N N UG M	N N UG M
1 D	309	C Y CA –	T Y F –	T Y F –	T Y CA –	T Y AO –	T N AO M
1 E		T Y CA –	T Y F –	T Y F –	T Y CA –	T Y MA –	T Y AO –
2 D		V+ Y AL –	V- Y AL –	T,# Y UG –	V+ Y AL –	V+ N AL,O,P,O,S	T,# Y UG –
2 E		V+ Y AL –	V- N AL BG	T,# Y UG –	V+ Y AL –	V- N AL S,BG	T,# Y UG –
1 D	310	N Y CL –	N Y UG –	C,H- N UG M	F Y CL –	F Y UG –	F,H+ Y UG
1 E		H+ Y CL –	F,H- Y UG –	C,H- Y UG –	C H+ Y CL –	F,H- Y UG –	H+ N HU –
2 D		V+ Y AL –	V- Y AL –	N Y AL –	N Y AL –	V- Y AL –	H+ Y UG –
2 E		N Y AL –	V- N AL BG	V- N AL BG	C Y CA –	C Y UG –	C,H+ Y UG –

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
311							
1	D	V+ Y CL-	V- N AL BG	C,V- N AO M	C,V+ Y CL-	V- N U.V -	N Y UG -
	E	V+ N CL M	V- N GU -	V- Y QUG -	V+ N GU -	V- N GU -	# N @UG-
2	D	V+ Y AL -	V- Y AL -	V+ Y GU-	V+ Y AL-	V- Y AL S	V- Y AL-
	E	V+ Y AL -	V- N AL BG	C,V+ Y AO S	V+ Y AL -	V- N AL S,BG	V- N AL S,B
312							
1	D	N Y AL -	V- N AL CO	V- Y AL -	N N AL F	V- Y AL -	V+ N AL C
	E	N Y AL -	V- N AL BG	V- N AL BG	V+ Y QCL -	V- N AL BG	V- N AL BG
2	D	N Y AL -	N Y AL -	N Y AL -	N Y AL-	N Y AL -	[illegible]
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S,BG	V+ Y AA -
313							
1	D	# N AL F	N N UE F	N N AL/OP O	V+ Y AL -	V+ N AL/OP O,S	N Y UG -
	E	V+ N AL BG	V+ N AL/OP O,S	V+ N AL/OP O,S	V+ N AL BG	V+ N AL/OP O,S	C,# N GI GI
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL S	C Y AO -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S,BG	V+ N AL/OP O,S

D E Individual Profile Sheet

ID

Int. 314

		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	N Y AL -	N N UN -	N Y HU -	N Y AL -	N Y QUG -	N Y AL -
	E	N Y AL -	N N QUG M	N N UN -	N Y AL -	N Y HU -	N Y HU -
2	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	V- Y AL -
	E	N N AL -	N N AL -	V- N AL BG	N Y AL -	N Y DF -	N Y DT -

315

1	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V- Y AL -
	E	V+ Y AL -	F,V- Y UG -	F,V- Y UG -	F,V+ Y CL	F,V- Y UG -	F,V- Y UG -
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V- Y AL -
	E	C,F Y AL -	C,V- Y F -	C,V- Y F -	V+ Y AL -	C,V- Y F -	F,V- Y AL -

316

1	D	C Y CS -	C,H- N F M	F,H- Y UG -	H+ Y AL -	H- Y QUG -	H- Y QUG -
	E	C Y CS -	C,H- Y F -	C,H- N UN -	C,H+ N CS M	C,H- Y F -	C,H- Y F -
2	D	N Y AL -	N Y AL -	N Y AL -	V+ Y AL -	V- N AL F	V- Y AL -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL BG	V- N AL BG

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
318							
1	D	C Y CA -	N N UG N	N N GU -	T Y CA -	N N GU -	N N UG N
	E	T Y CS -	T Y F -	N N QUG -	T Y CA -	N N GU -	N N GU -
2	D	N Y AL -	V- Y AL -	F Y UG -	V+ Y AL -	# Y HU -	# Y UG -
	E	V+ N AL CO	C,V- Y T -	V- N AL BG	V+ Y AL -	C# Y YA -	V+ N ALOP 9S
319							
1	D	C N CF Y	C Y F -	C Y F -	C Y CL -	C Y F -	F Y UG -
	E	F Y CL -	C Y F -	C N F N	C Y CL -	C Y F -	C Y UG -
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL S	V- Y AL S
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL S,BG	V- N AL S,BG
320							
1	D	H+ Y CL -	H- Y AL -	H- Y AL -	H+ Y AL -	H- Y AL -	H- Y AL -
	E	C Y CS -	C Y F -	F Y F -	C Y CL -	C Y F -	C Y F -
2	D	V+ Y AL -	V- N AL BG	C,V- N OPO	V+ Y AL -	C# Y F -	C,V- Y F -
	E	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V- Y AL -

D E Individual Profile Sheet

Int.	ID		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1		D	H+ Y AL-	C,H- N F M	F,H- Y UG-	H+ Y AL-	C,H- Y F-	H- Y AL-
		E	H+ Y AL-	C,H- Y F-	H- N HU-	H+ Y AL-	C,H- Y F-	H- N HU M
2		D	V+ Y AL-	V- Y AL-	V- Y AL-	# Y AL-	C N OP M,O	F Y UG-
		E	V+ Y AL-	V- N AL BG	V- N AL BG	V+ Y AL-	V- N AL BG	V- N AL BG
1	322	D	T N CL F	F Y UG-	T Y F-	T Y CL-	F Y UG-	F N UG M,F
		E	T Y C'-	T N MA M	T Y MA-	F Y CL-	T Y UG-	F,T Y UG-
2		D	V+ Y AL-	V- Y AL-	V- Y AL-	V+ Y AL-	C,V- Y AO S	C,V- Y AO S
		E	V+ Y AL-	V- N AL BG	V- N AL BG	V+ Y AL-	C,V- N AO M	C,# Y AO-
1	323	D	H+ N CL M	F,H- N DF M	F,H- Y DF-	C Y CL-	C,H- Y DF-	F Y UG-
		E	C Y CL-	N N DF M	H- Y DF-	N Y CL-	N N OP O	N Y UG-
2		D	# Y AL-	H-,V- Y AL-	V- Y AL-	V+ Y AL-	V- Y AL-	V- Y AL-
		E	V+ Y AL-	V- N AL S	V- N AL BG	V+ Y AL-	V- N AL BG	V- N AL BG

nt.	325	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	C Y CL -	C Y F -	F N UG M,F	F N CL M	F N UG M F	F Y UG -
	E	F N CS -	F N DF M	F N OF M	F Y CS -	F N UG M	F Y UG -
2	D	N Y AL -	N Y AL -	V- Y AL -	V+ Y AL -	V- Y AL S	C,# N UG M
	E	V+ Y AL -	V- N GU -	V- N GU -	V+ Y AL -	V- N GU -	F N UG M

	327						
1	D	H+ N CL M	C,H- Y F -	C,H- Y F -	C,H+ Y CL -	C,H- Y F -	C,H+ N O,S
	E	C,H- Y CL -	C,H- Y F -	C,H- Y F -	C,H+ Y CL -	C,H- N F M	C,H- Y UG S
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V+ N AL/OP O,S
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL BG	V+ N AL/OP O,S

	328						
1	D	N N CL M	C Y F -	N N GI GI	N N GI -	N N UG M	N N UG M
	E	N N CL M	C Y F -	N N GI GI	N N CS N	C N YA M	C Y AC -
2	D	N N CL -	N Y AL -	N N OP O	V+ Y AL -	F Y UG -	F Y UG -
	E	V+ N AL CO	V- N AL BG	N N AL/OP O	V+ Y AL -	F N UG -	F N UG -

D E Individual Profile Sheet

ID

Int.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
329							
1	D	N N UN -	N N GU -	N N QUG -	N Y UN -	F N UG M	M Y AL -
	E	C Y CA -	C N F M	C, H- N F M	H+ Y HU -	H- N UN -	# N GU -
2	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- Y AL -	V- Y AL S
	E	V+ Y AL -	V- N AL OP O	V- N AL OP O	V+ Y AL -	V- N AL S, BG	V- N AL OP O
330							
1	D	N N UN -	N Y UN -	N N UN -	N N UN -	N Y UN -	N N UN -
	E	N N GU -	N N GU -	N N GU -	N N GU -	N N GU -	N N GU -
2	D	N Y CS -	N N GI GI, F	N N OP O	N N GU -	N N GI GI, F	N N GU -
	E	N N GU -	N N GU -	N N GU -	N N GU -	N N GU -	N N GU -
331							
1	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -
	E	N Y GCL -	N N HU -	N N HU -	N Y AL -	N N HU -	N N HU -
2	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N N AL OP O	# Y AL -
	E	N Y AL -	V- N AL BG	V- N AL BG	V- N AL S, BG	V- N AL S, BG	V- N AL S, BG

D E Individual Profile Sheet

nt.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
3321							
1	D	N N GU -	N N UG M	N N UN -	N Y AL -	- ? ? -	N Y UG -
	E	N N GU -	N N UG F	N N UG F	- ? ? -	N N UG F	- ? ? -
2	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -
	E	N N AL CO	N N AL BG	N N AL BG	N N AL CO	N N AL BG	N N AL BG
3331							
1	D	N Y HU -	N Y HU -	C Y F -	C Y CL -	N N HU -	N Y UV -
	E	N N AL F	N N HU -	N N HU -	N Y HU -	N Y HU -	N N HU -
2	D	N Y AL -	N N AL OP O	N Y AL -	V+ Y AL -	N Y AL -	N Y FL -
	E	N Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- Y AL -	N N HU -
3341							
1	D	N Y HU -	N N HU -	C Y F -	N Y QCL -	N Y QUG -	N Y QUG -
	E	C Y QCL -	N Y QUG -	C Y F -	N N AL CO	N N HU F	N Y HU -
2	D	H+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V+ Y AL -	V- Y FL -
	E	V+ Y AL -	V- N AL BG	V- N AL BG	V+ Y AL -	V- N AL BG	V- N AL BG

D E Individual Profile Sheet

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	N Y QCS-	N N QDF-	N N UG M	N Y CL -	N Y QDF -	N Y DF-
	E	N N QCS -	N N GU -	N N GU -	N N CL -	N N QUG -	N N HU -
2	D	N Y AL -	N N AL CO	N Y AL -	N Y AL -	N N HU -	N Y AA -
	E	N N UN -	# N ALHOP O	# N ALHOP O	# N ALHOP D,CO	V+ N ALHOP D,S	V+ N ALHOP O,S
	336						
1	D	N Y QCS -	N Y QPT -	N N HU -	N Y AL -	N N HU -	N Y QUG -
	E	N Y AL -	N N QUG F	N Y QUG -	N Y AL -	N N HU -	N Y HU -
2	D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -
	E	N Y AL -	N Y QDF	N Y QDF -	N N AL CO	N Y QDF -	N N UN -

APPENDIX C

NUMBER SET ASSIGNMENT FOR NUMBER TRIPLES

Number Set Assignment (Interview I)

Student ID#

	101	102	103	104	105	196	107	108	109	110	111	112	113	114	115	116
D	2	5	3	2	5	4	4	2	1	5	3	2	6	4	4	3
E	1	1	6	5	1	6	3	1	4	4	5	4	5	2	3	2

Student ID#

	117	118	119	12	121	123	124	125	127	128	129	130	131	132	133	134
D	1	1	5	6	6	4	3	5	3	4	4	5	6	1	5	1
E	5	4	2	3	4	3	2	2	6	1	6	4	5	3	4	6

Student ID#

	135	137	139	140	141	143	144	147	148	151	152	153	154	155	158	159
D	5	1	4	1	5	6	6	5	4	3	3	1	2	1	6	2
E	2	6	2	4	3	3	4	3	2	5	6	5	5	6	2	4

Student ID#

	160	162	163	164	165	166	167	168	169	170	171	172	173	175	177	301
D	3	3	5	2	3	2	6	6	2	6	6	5	3	1	6	4
E	2	5	3	6	1	1	2	4	4	2	3	1	1	5	5	2

Student ID#

	302	303	304	305	306	307	308	309	310	211	312	313	314	315	316	318
D	1	5	6	3	4	3	1	6	2	6	6	1	4	4	6	5
E	4	2	4	2	6	6	3	3	5	5	3	6	2	3	2	4

Student ID#

	319	320	321	322	323	325	327	328	329	330	331	332	333	334	335	336
D	5	5	4	3	3	2	5	3	3	2	4	5	1	2	6	1
E	4	1	1	6	5	1	3	2	5	5	6	2	6	4	2	3

Number Set Assignment (Interview II0

Student ID#

	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116
D	4	2	4	6	2	1	3	4	3	1	6	4	5	5	3	6
E	3	1	1	3	1	3	2	3	6	6	2	6	4	3	2	5

Student ID#

	117	118	119	120	121	123	124	125	127	128	129	130	131	132	133	134
D	2	3	6	3	1	3	6	1	4	2	1	1	5	1	1	4
E	6	6	3	5	5	2	5	2	1	5	3	6	4	4	6	2

Student ID#

	135	137	139	140	141	143	144	147	148	151	152	153	154	155	158	159
D	6	4	5	3	6	3	1	6	5	6	4	2	5	4	2	4
E	3	2	3	6	4	5	5	4	3	2	1	6	2	2	4	6

Student ID#

	160	162	163	164	165	166	167	168	169	170	171	172	173	175	177	301
D	6	6	6	3	3	4	2	1	4	1	3	1	2	2	5	2
E	5	2	4	1	4	3	4	5	6	4	5	4	1	6	4	5

Student ID#

	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	318
D	3	6	1	6	1	4	5	3	5	5	3	4	5	3	2	1
E	6	3	4	5	3	1	1	5	2	4	5	2	3	2	4	6

Student ID#

	319	320	321	322	323	325	327	328	329	330	331	332	333	334	335	336
D	1	2	2	4	6	4	6	6	6	5	1	6	4	4	2	5
E	6	1	5	1	2	3	4	5	2	2	3	3	2	6	4	1

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